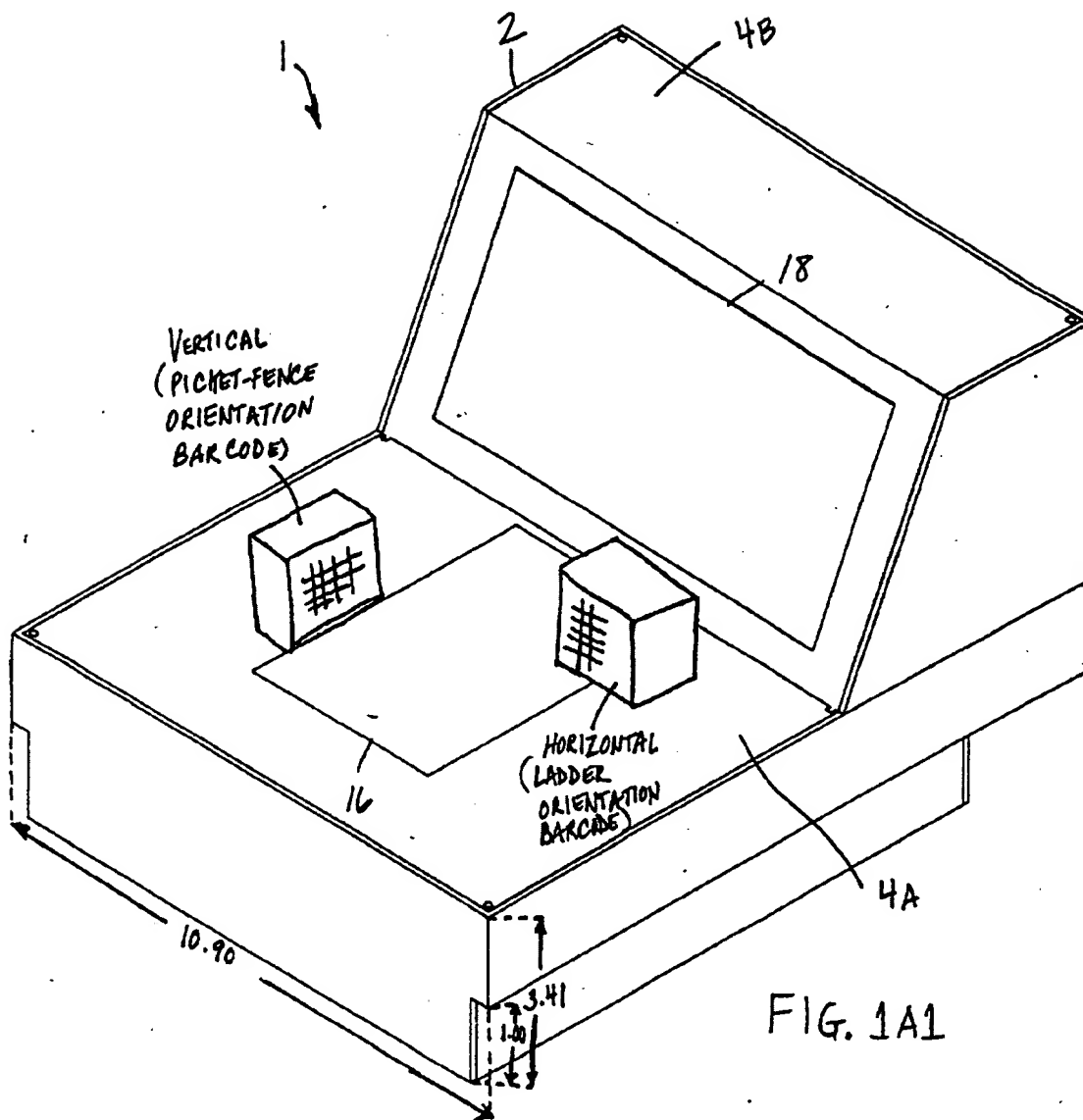


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Best Available Copy

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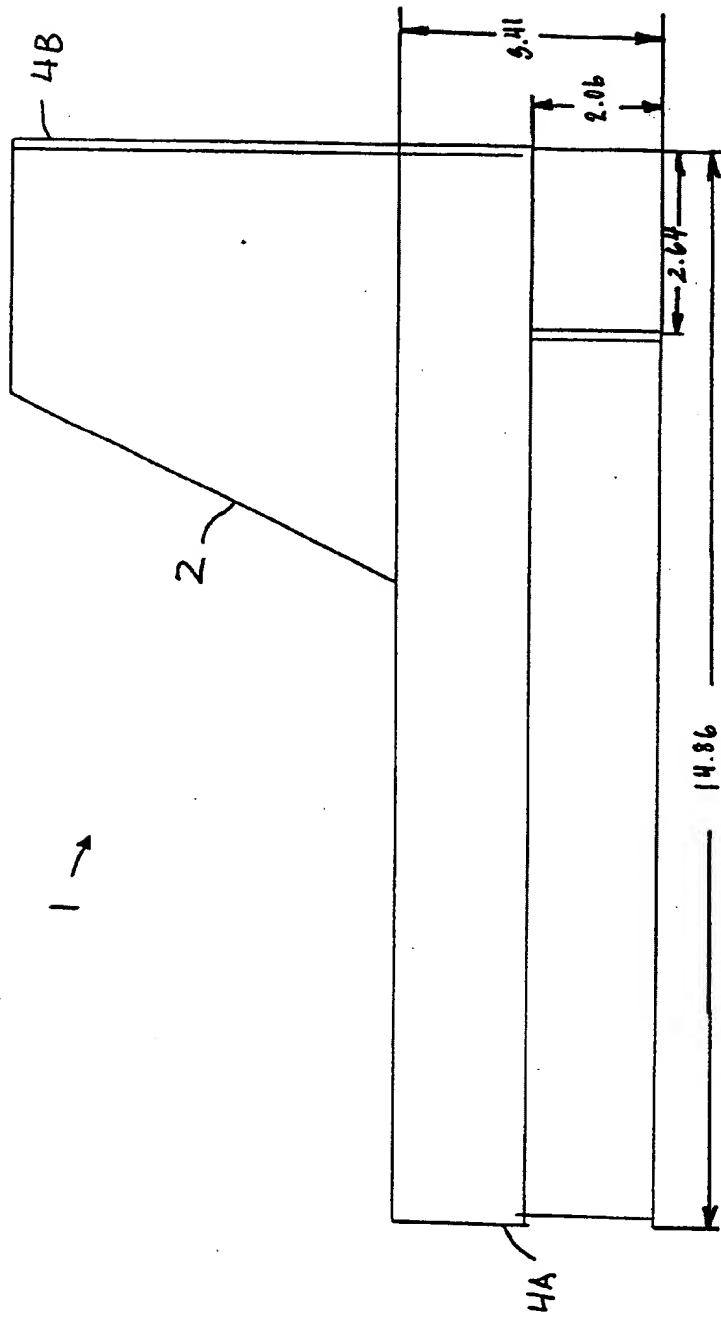


FIG. 1A2

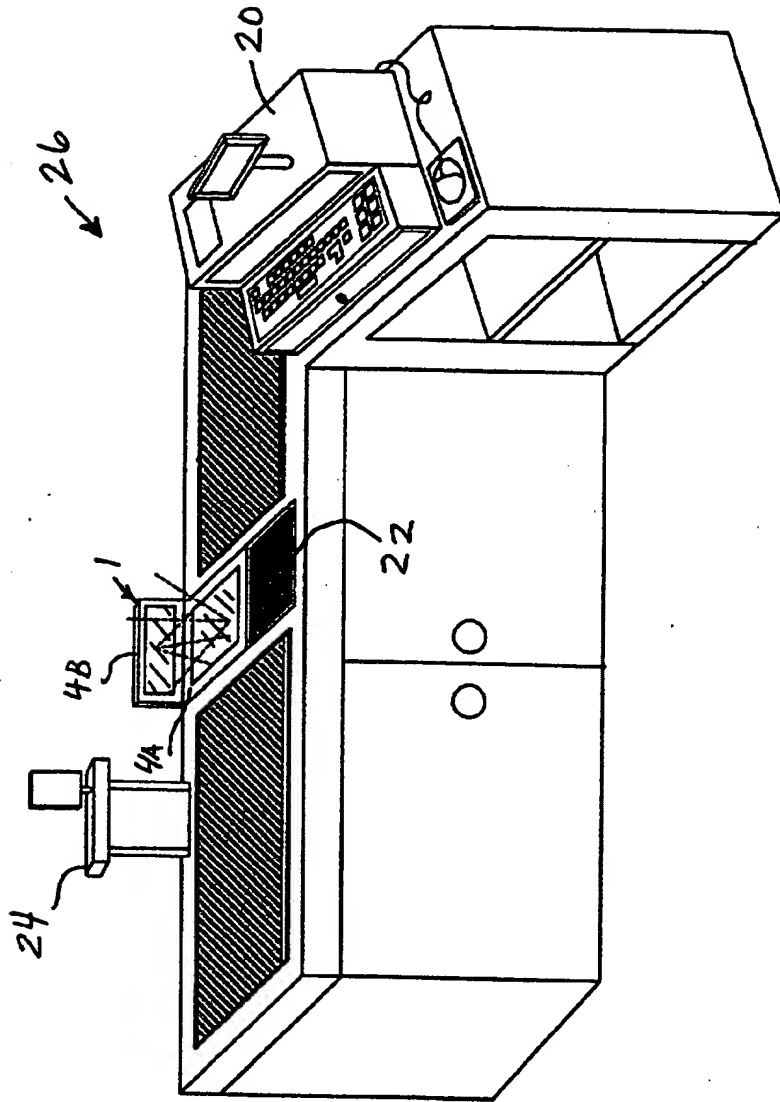


FIG. 1B

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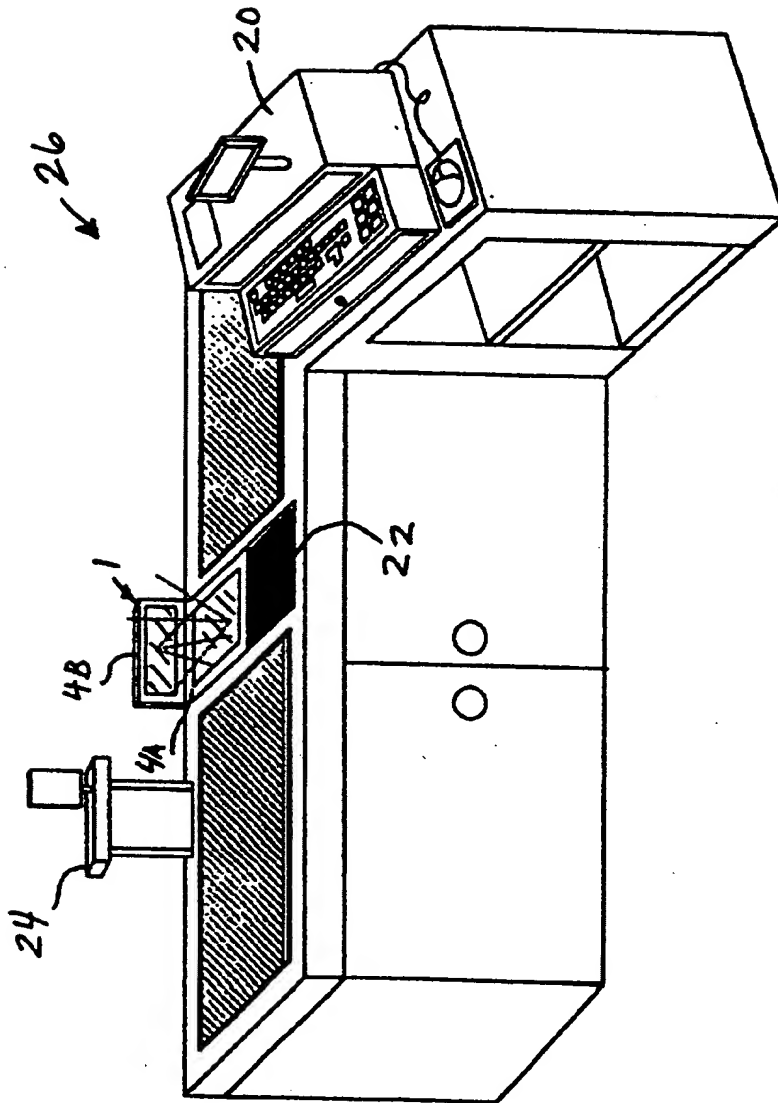


FIG. 1B1

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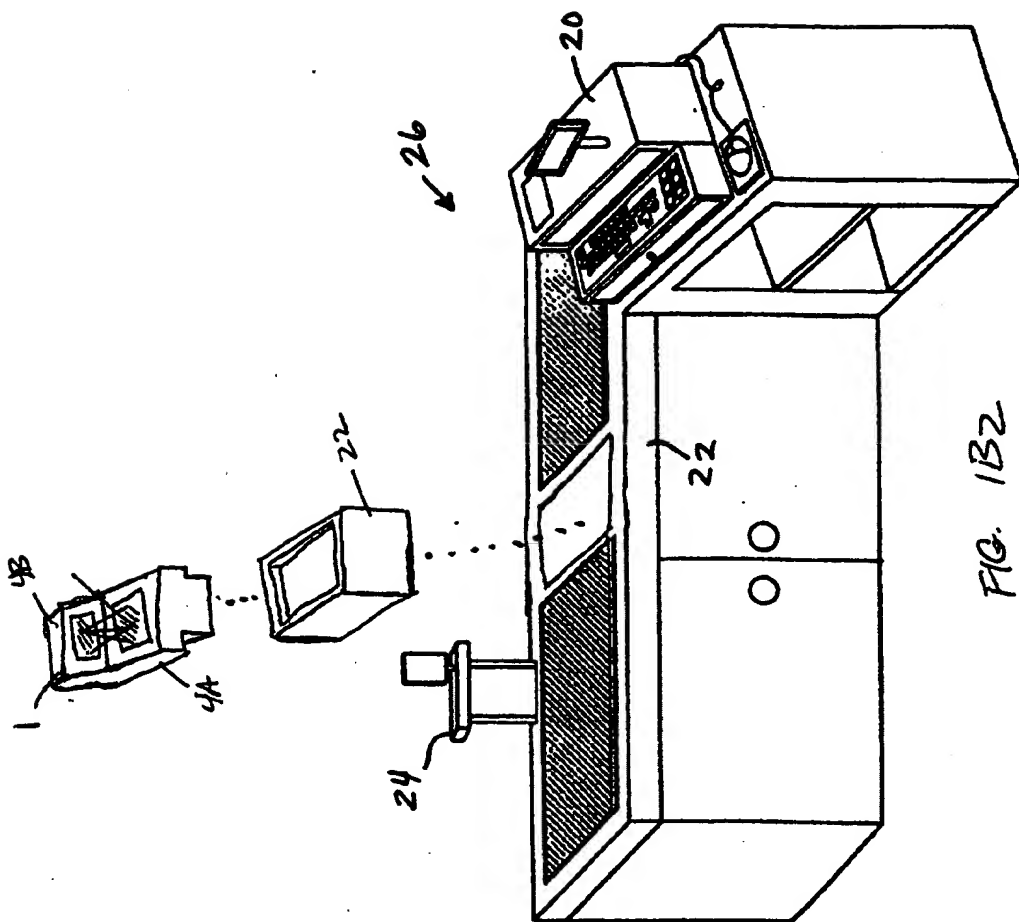


FIG. 1B2

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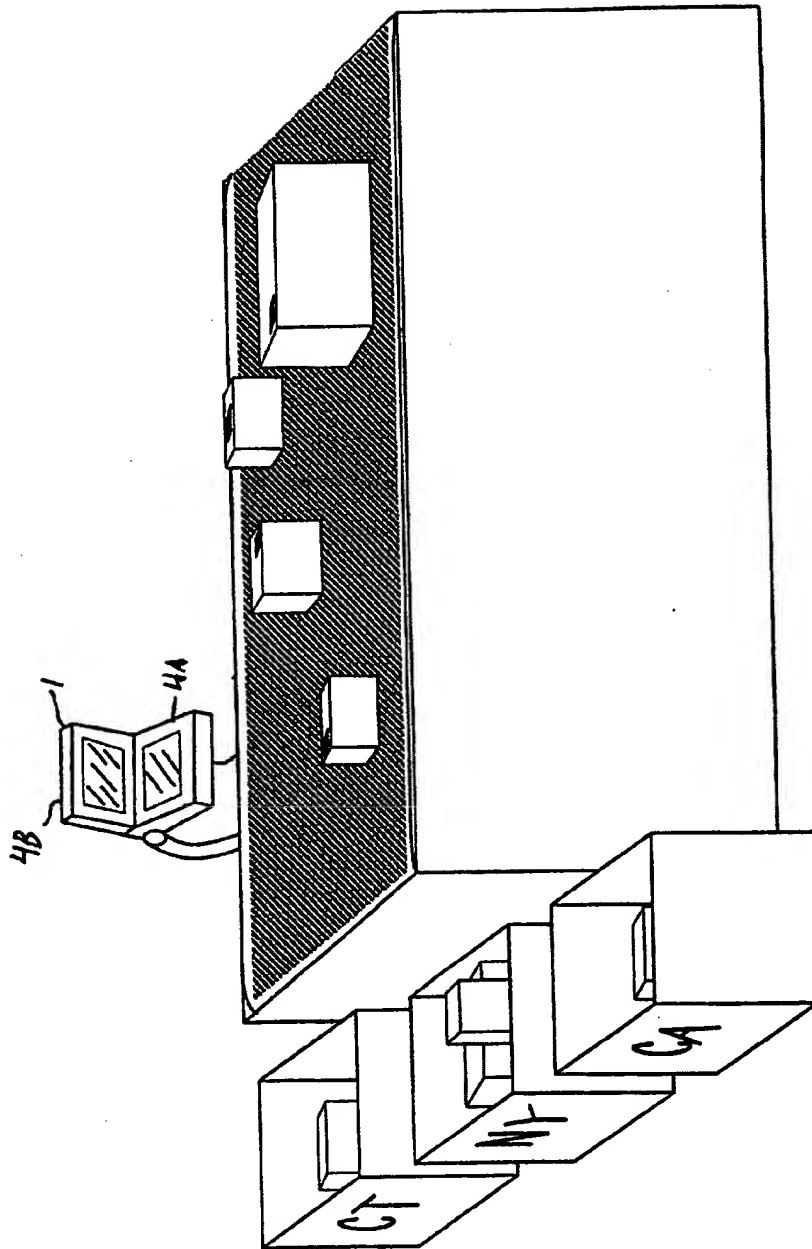
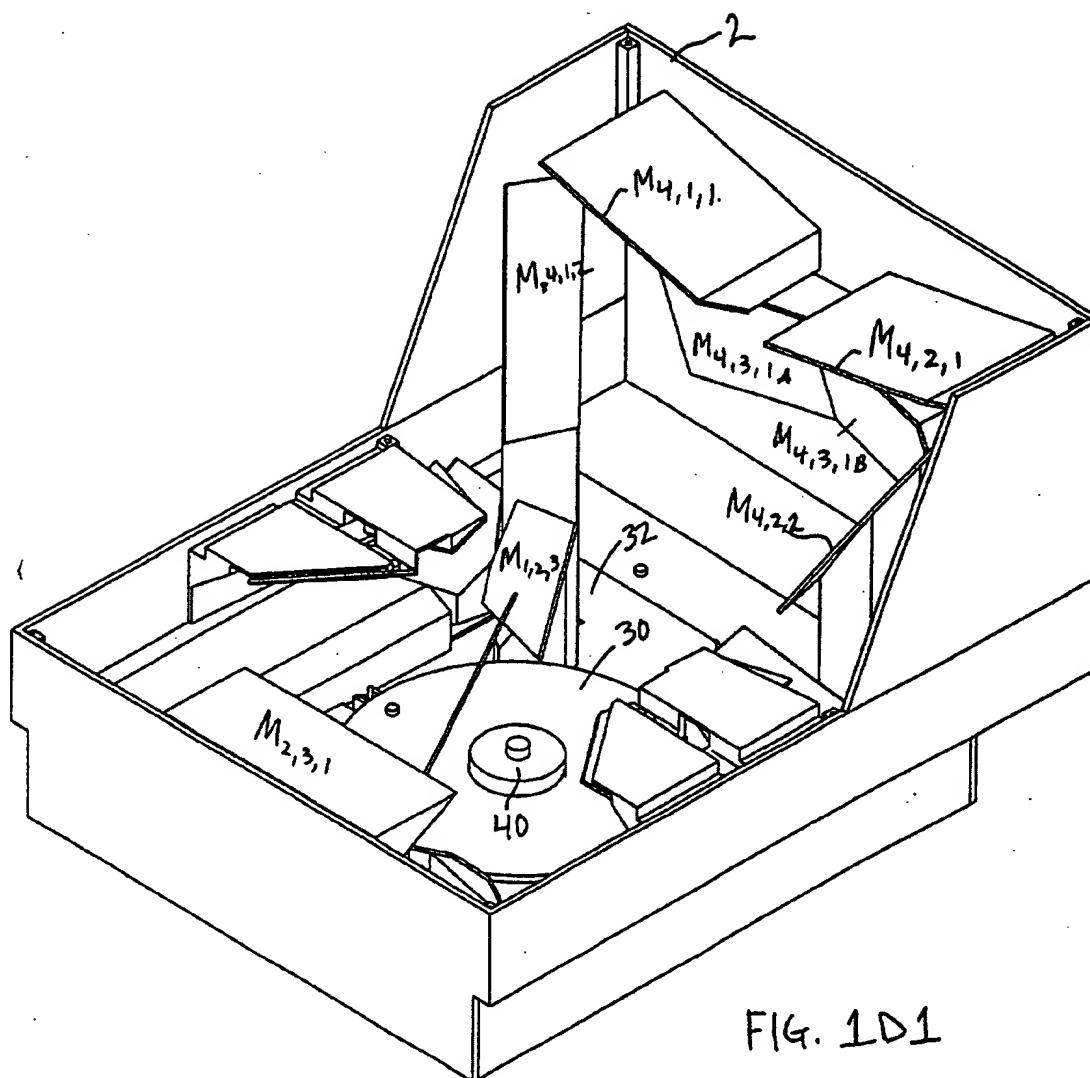


FIG. 1C

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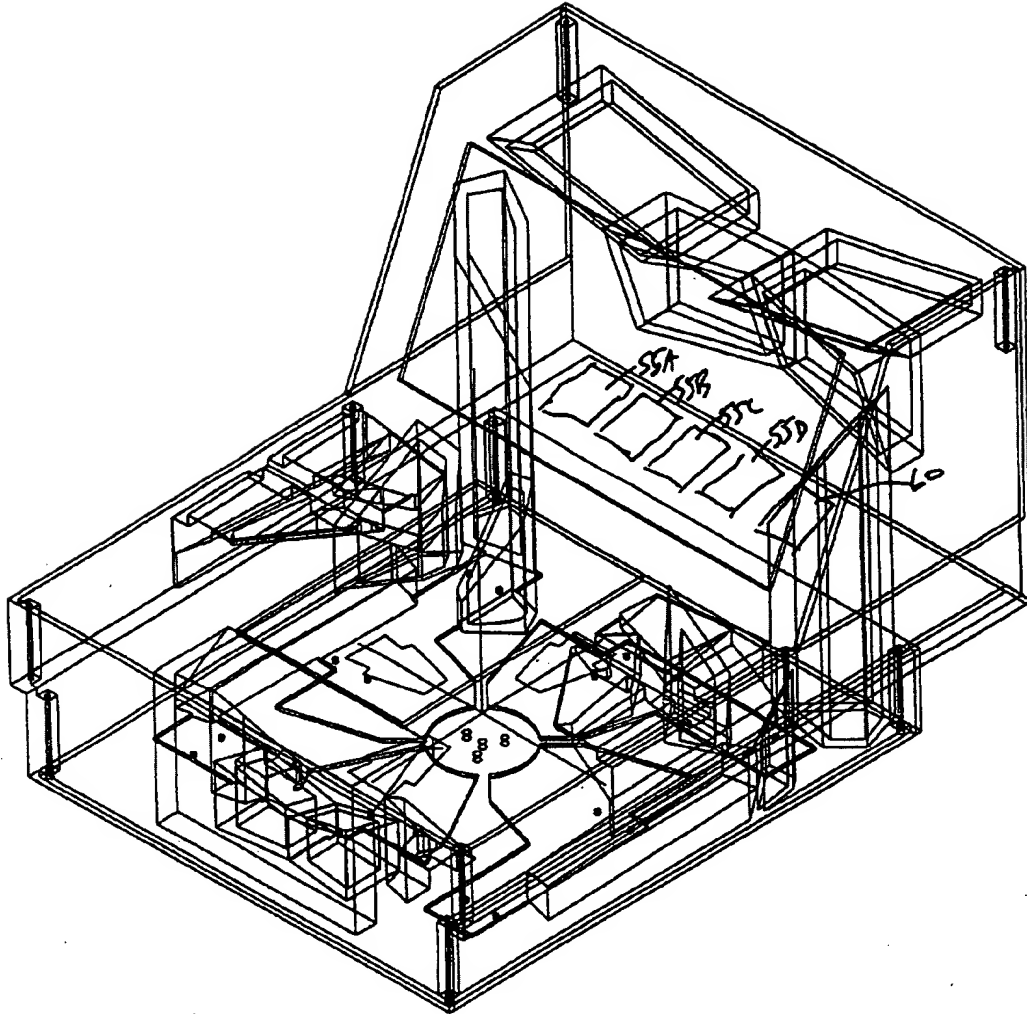


FIG. 1D2

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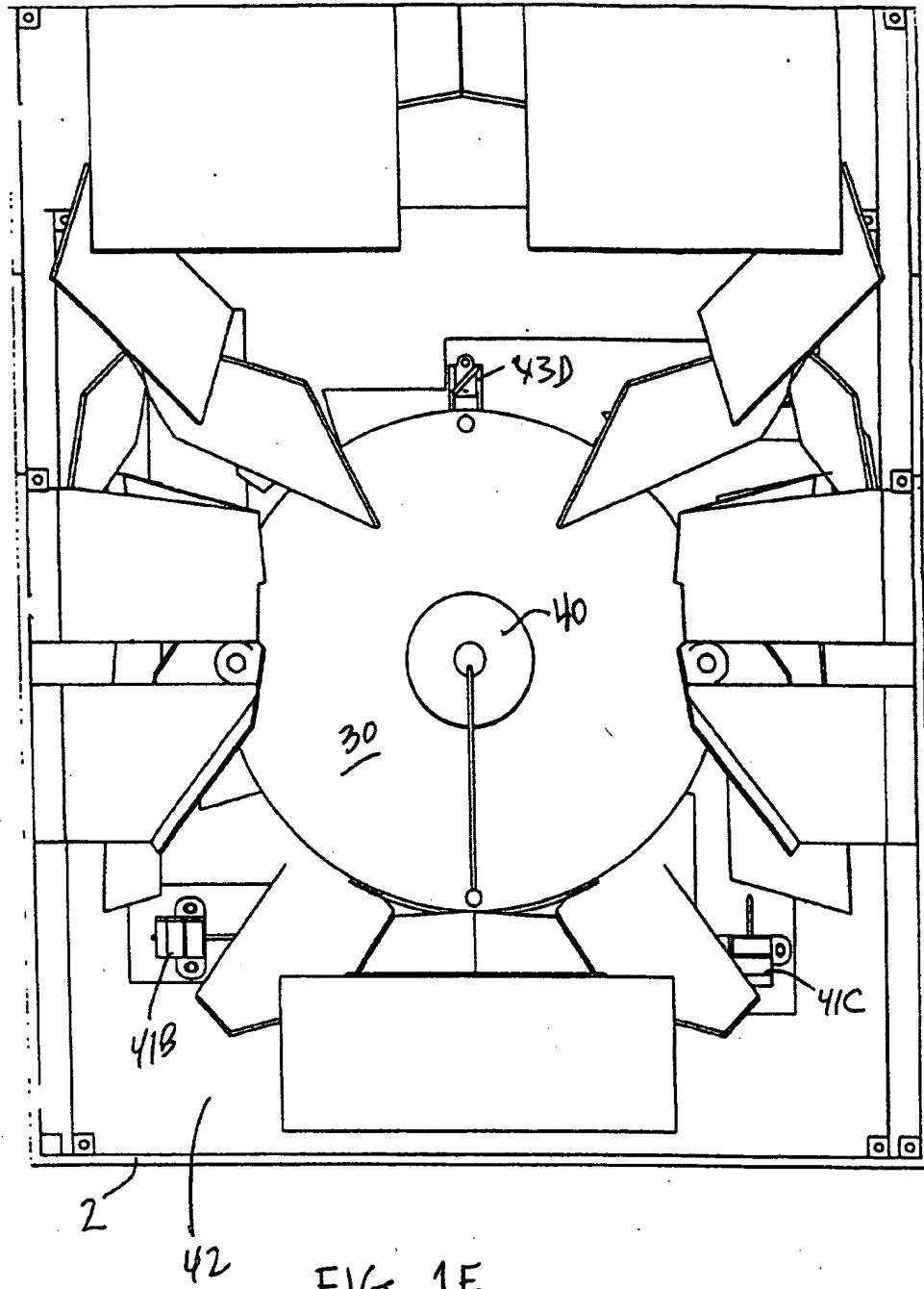


FIG. 1E

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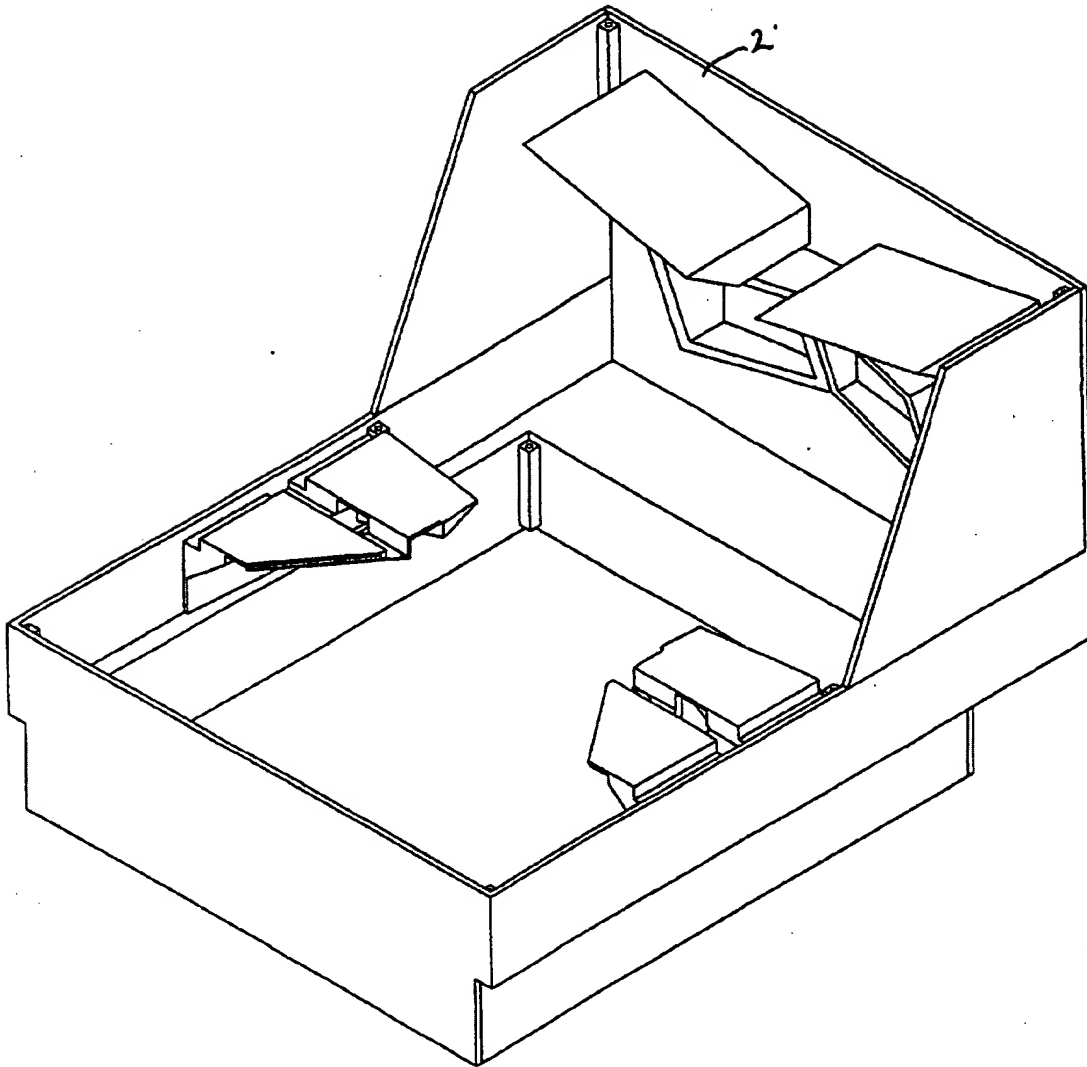


FIG. 1F

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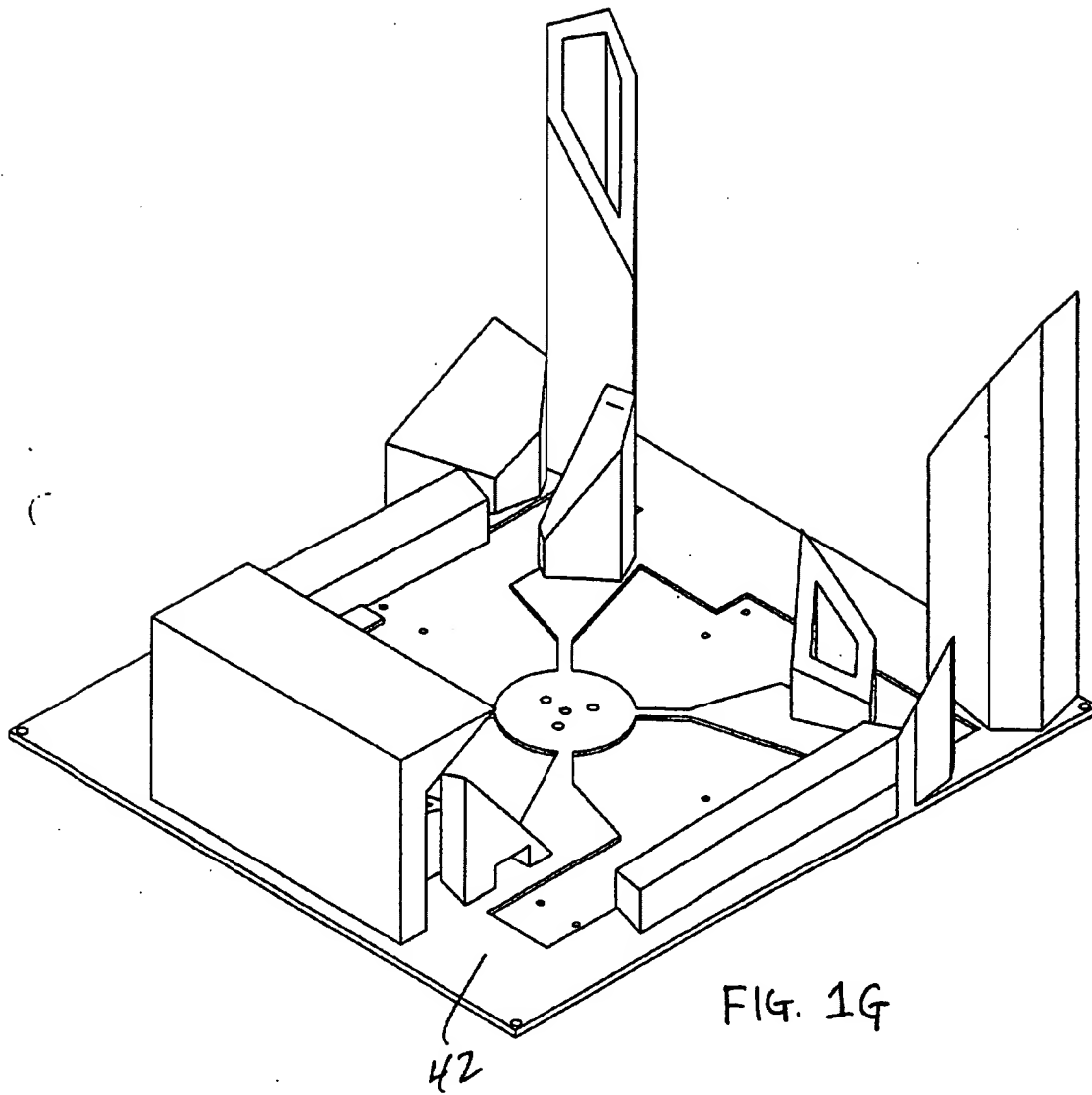


FIG. 1G

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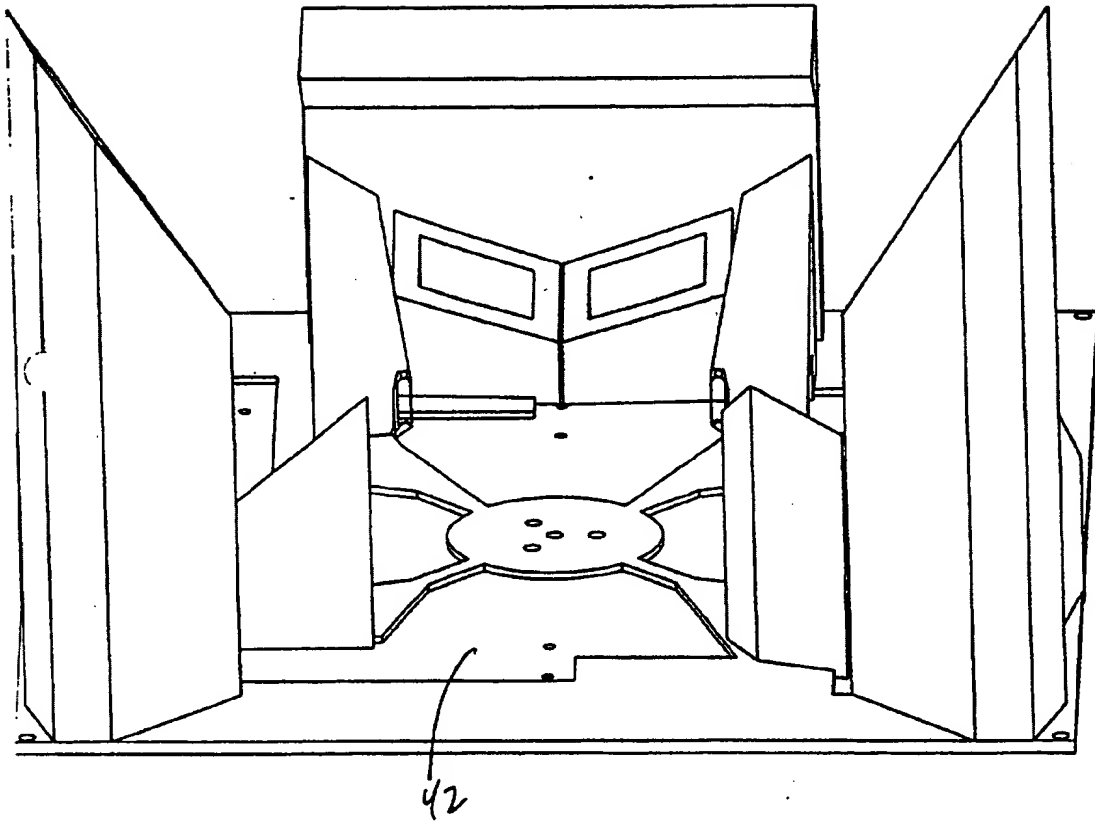
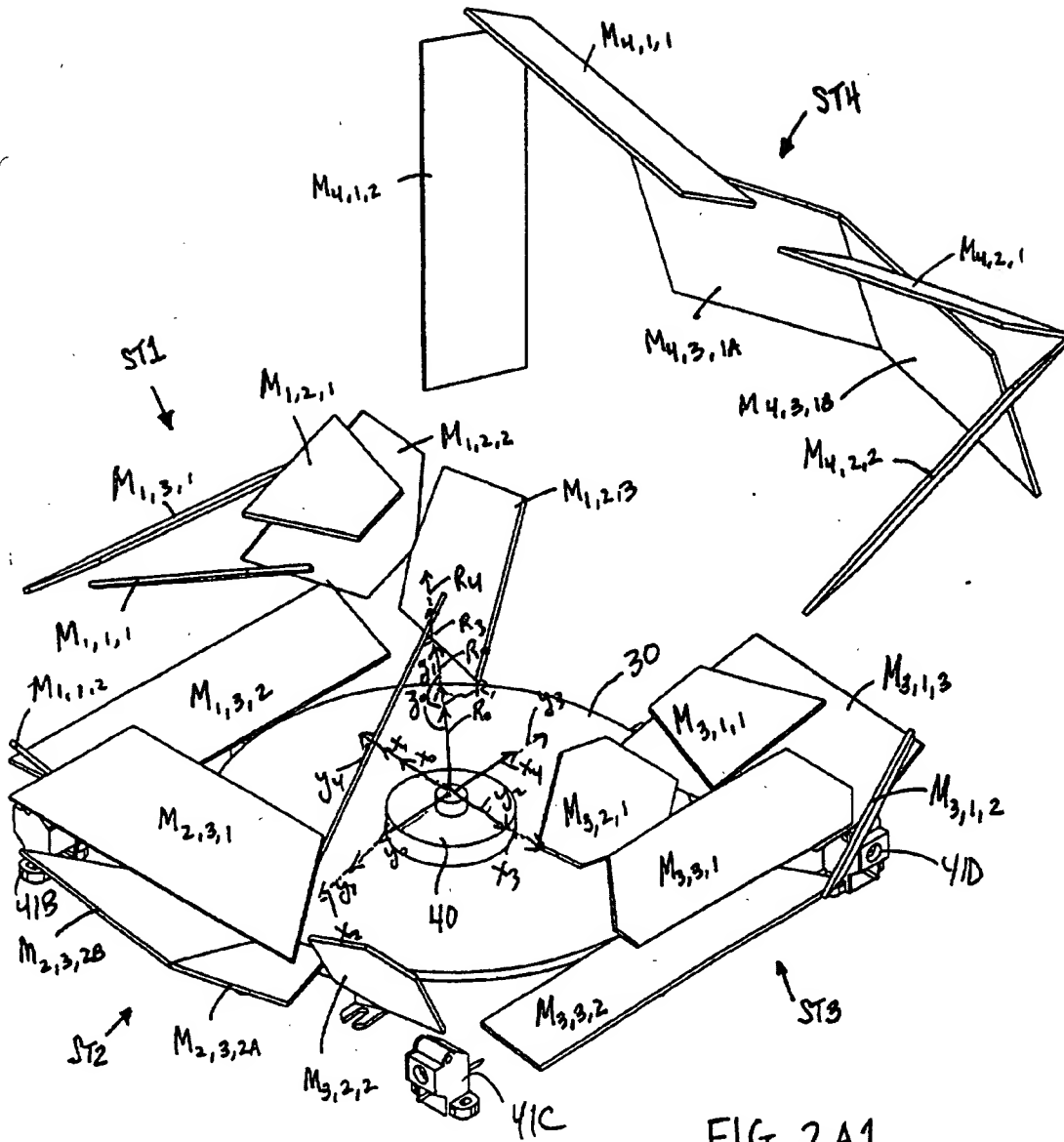


FIG. 1H

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Define: R_1, R_2, R_3, R_4, R_0

FIG. 2A1

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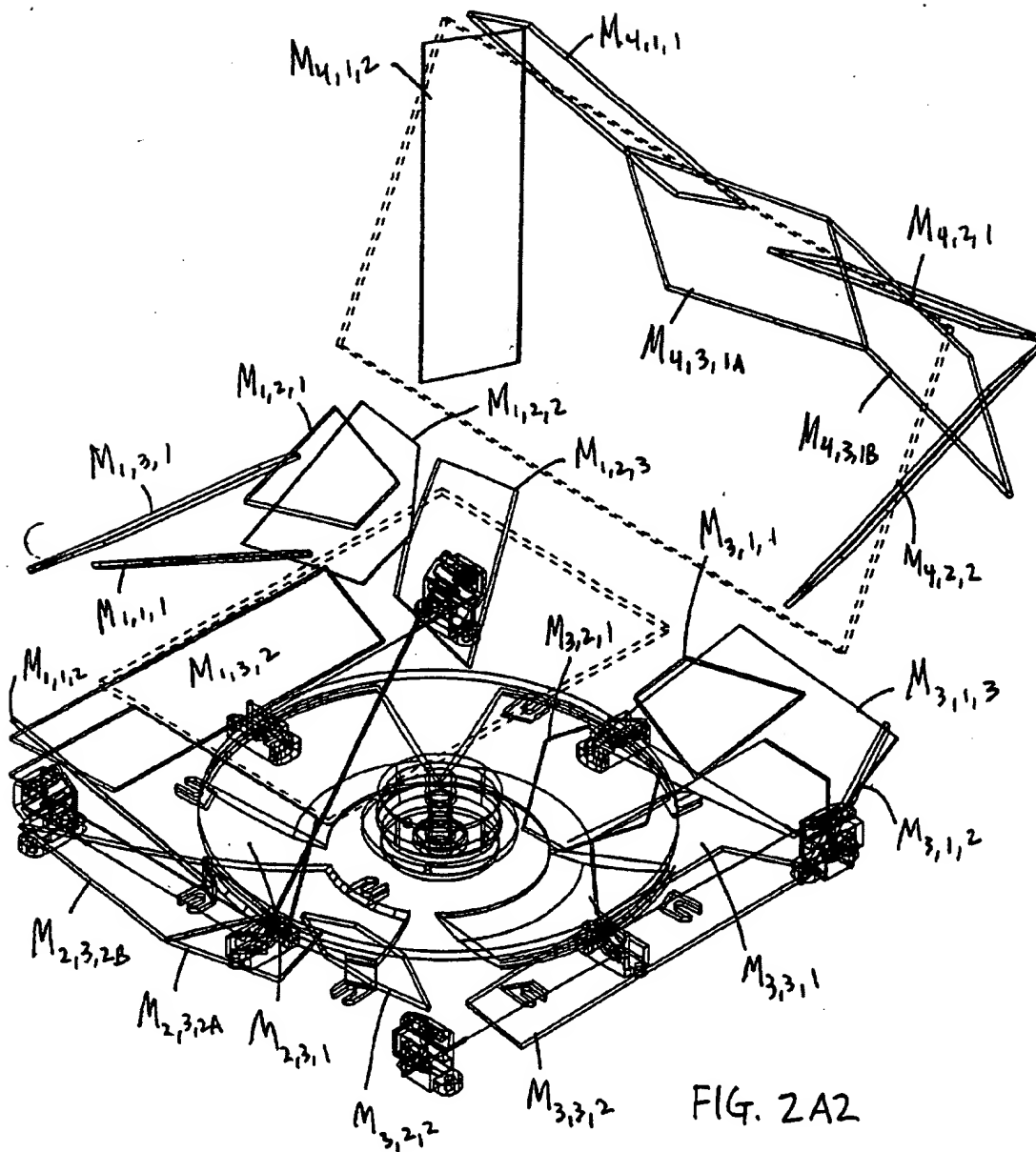


FIG. 2A2

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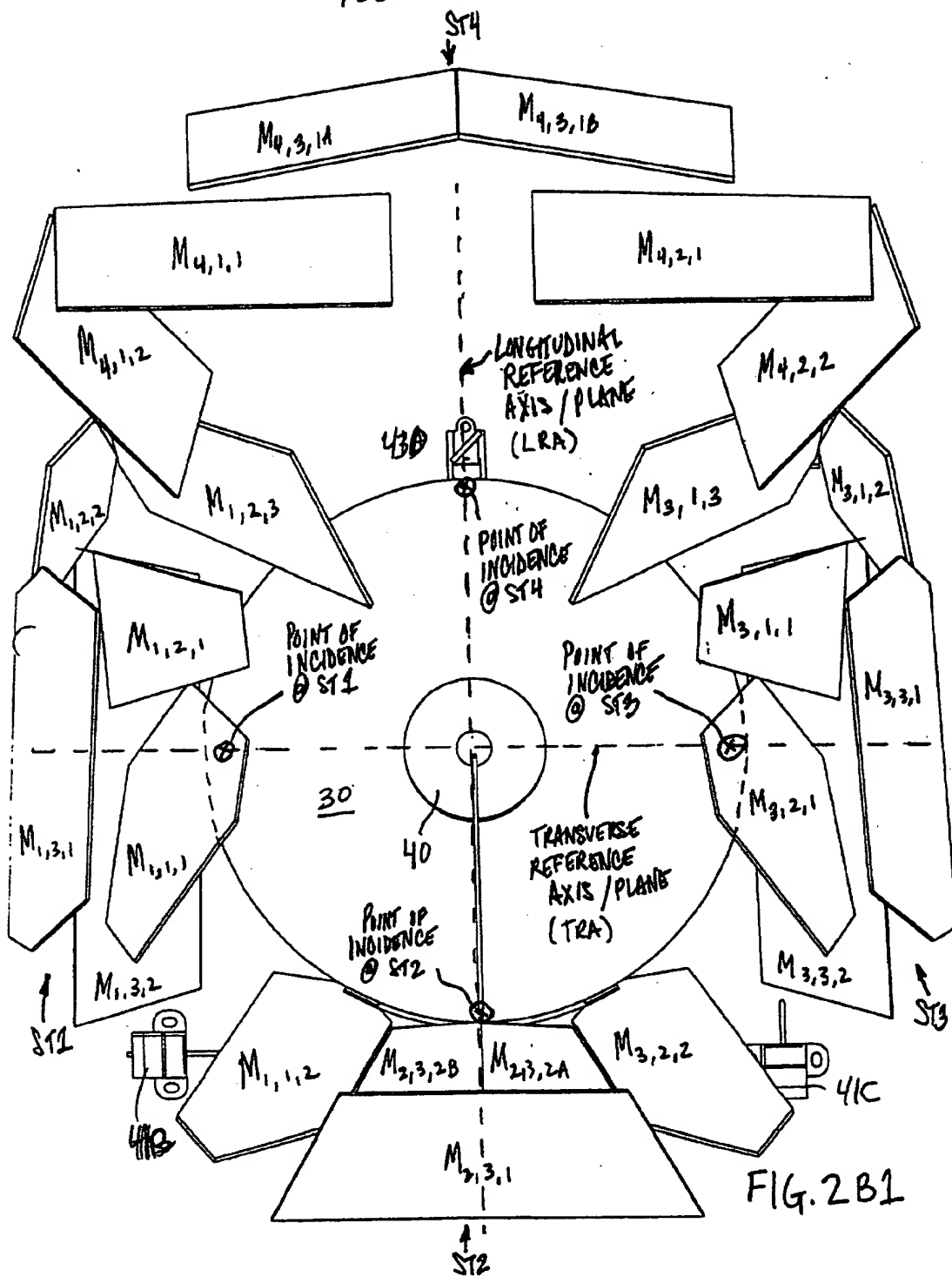


FIG. 2B1

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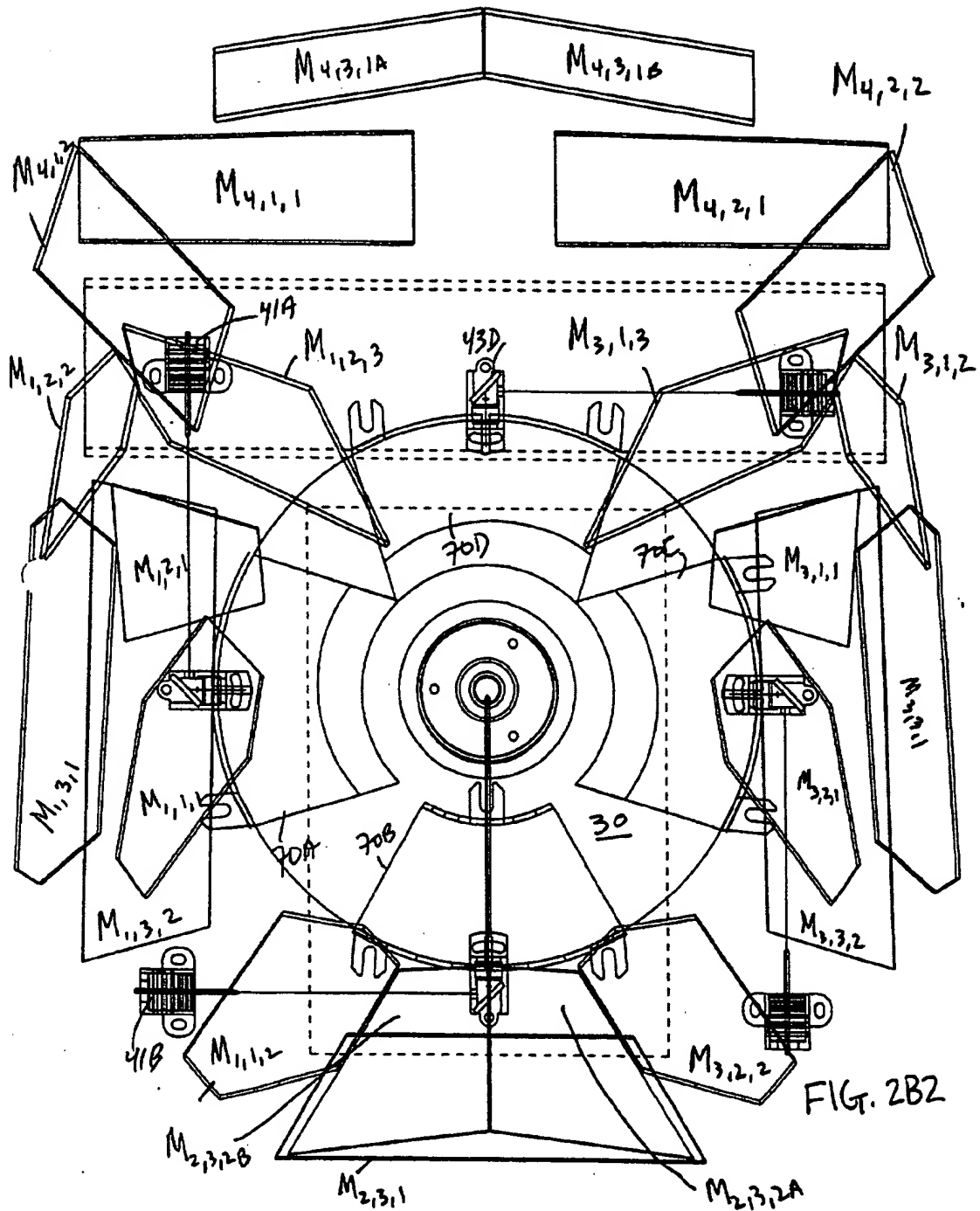


FIG. 2B2

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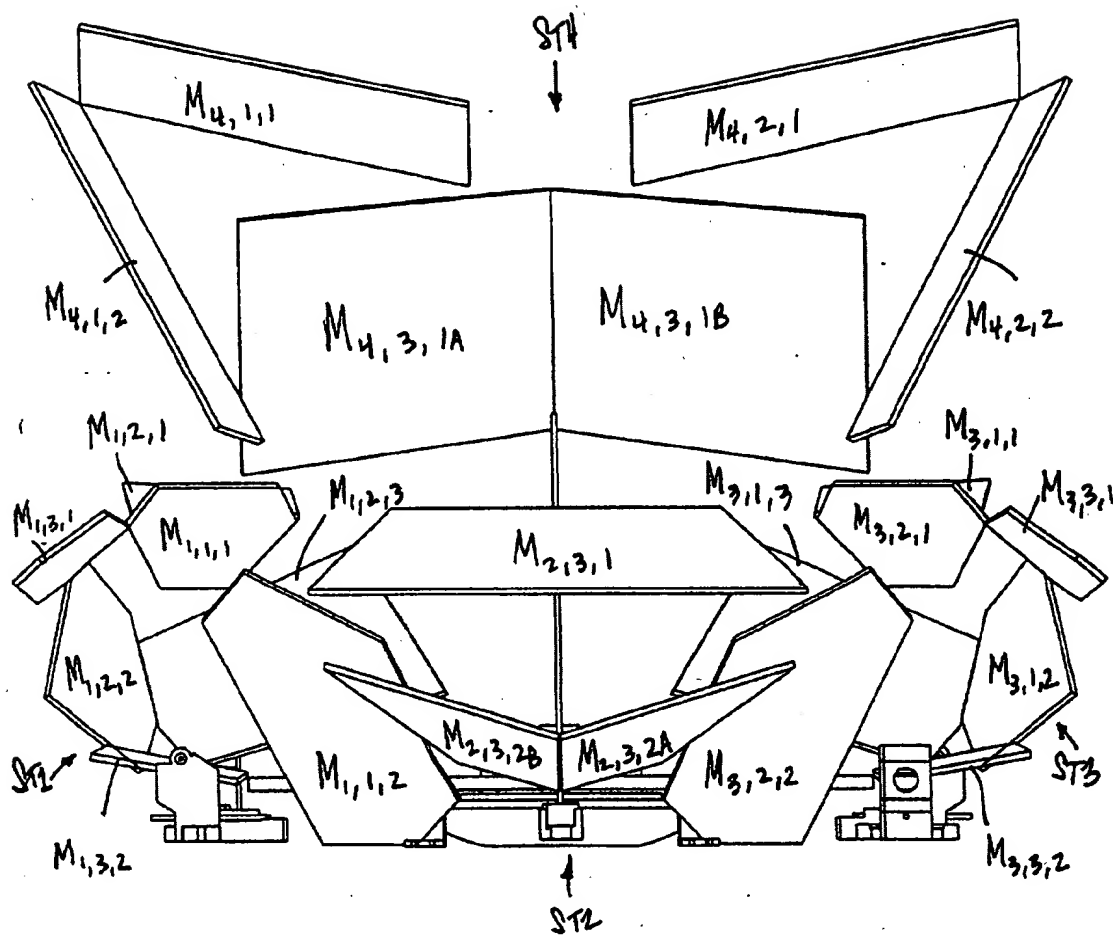


FIG. 2C1

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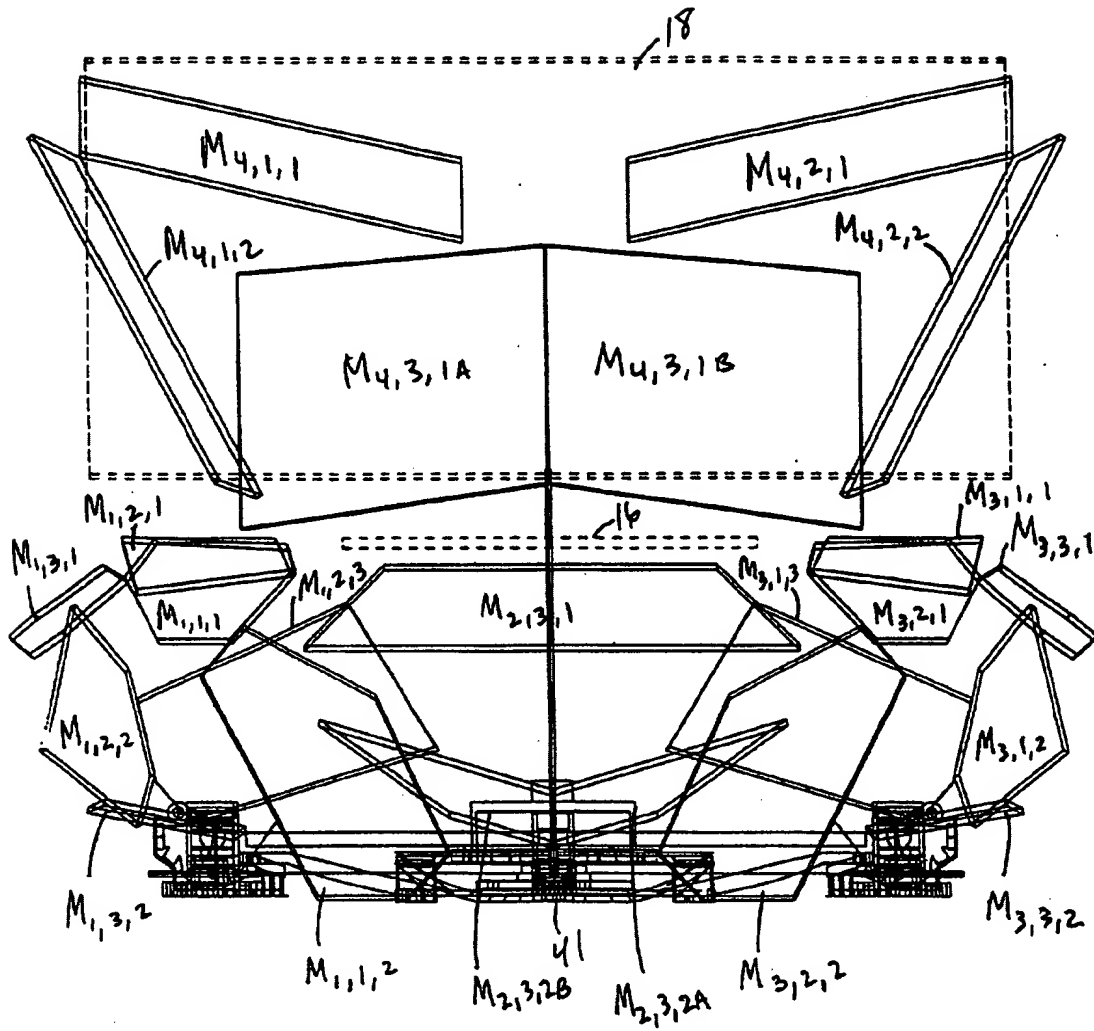


FIG. 2C2

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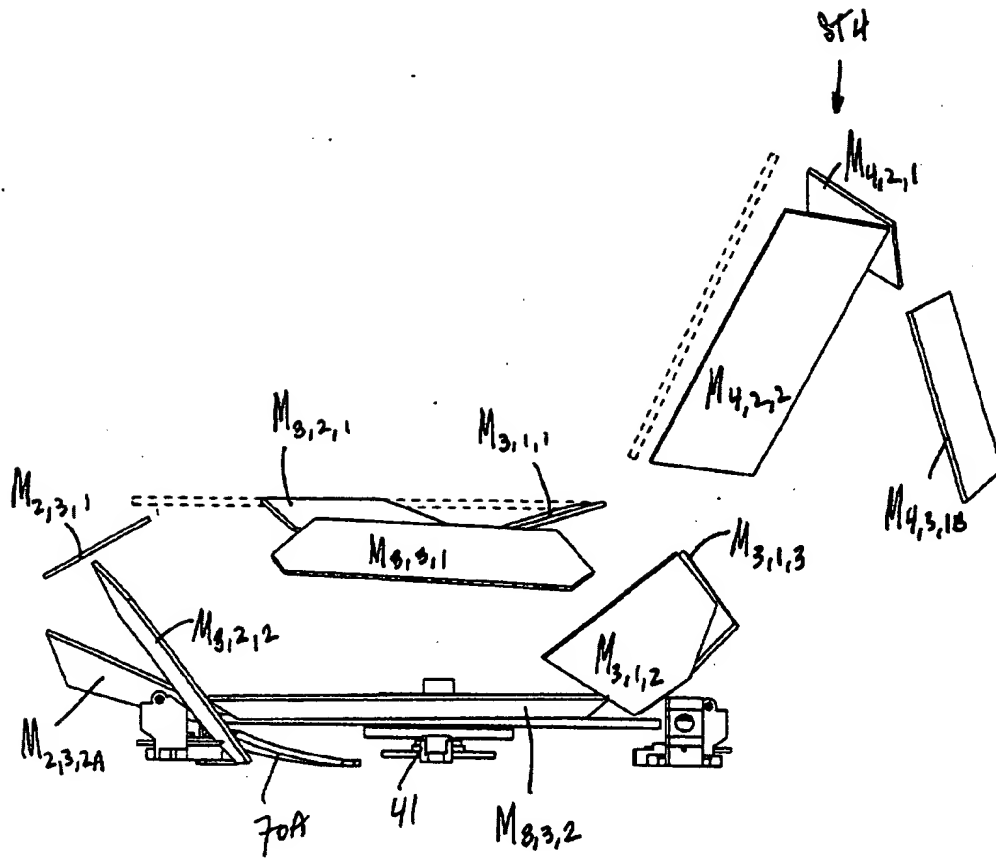


FIG. 2D1

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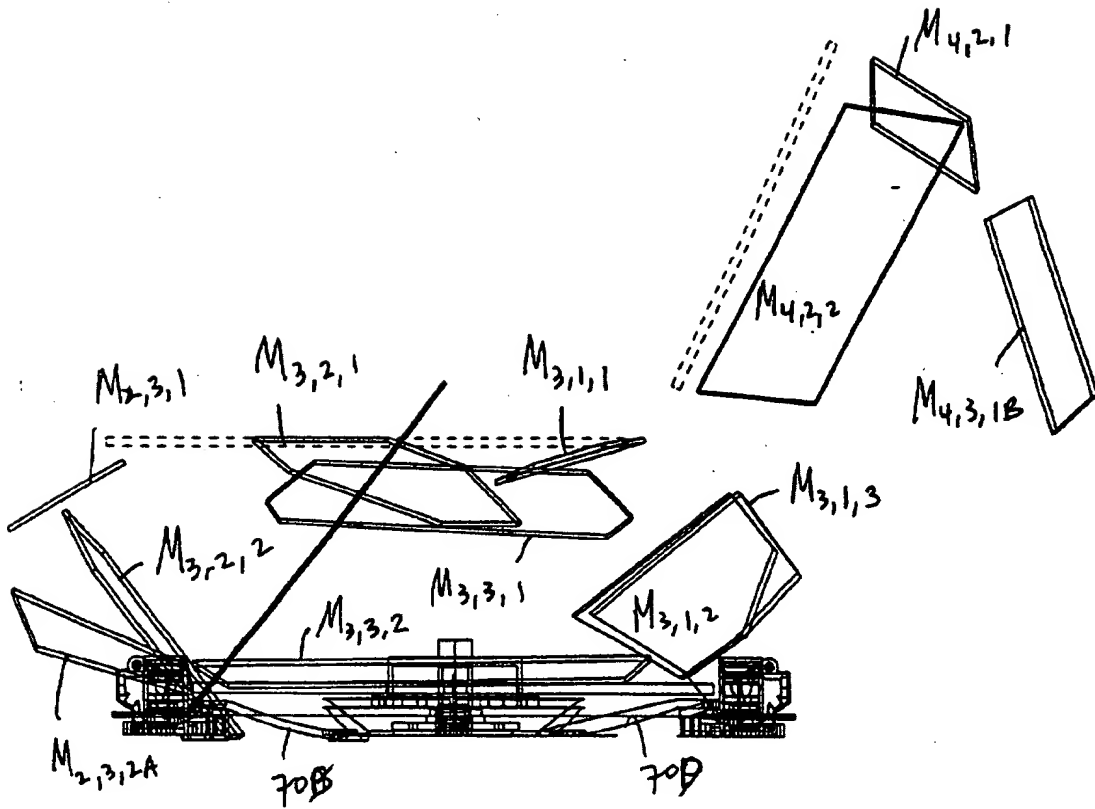


FIG. 202

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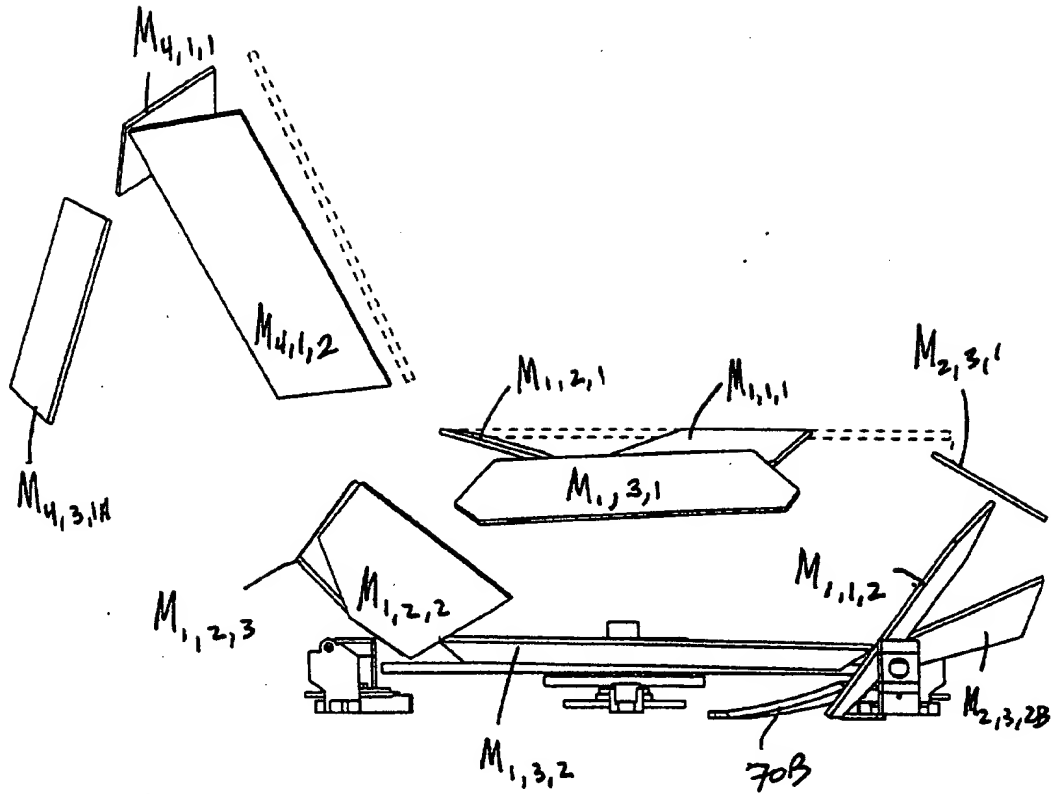


FIG. 2E1

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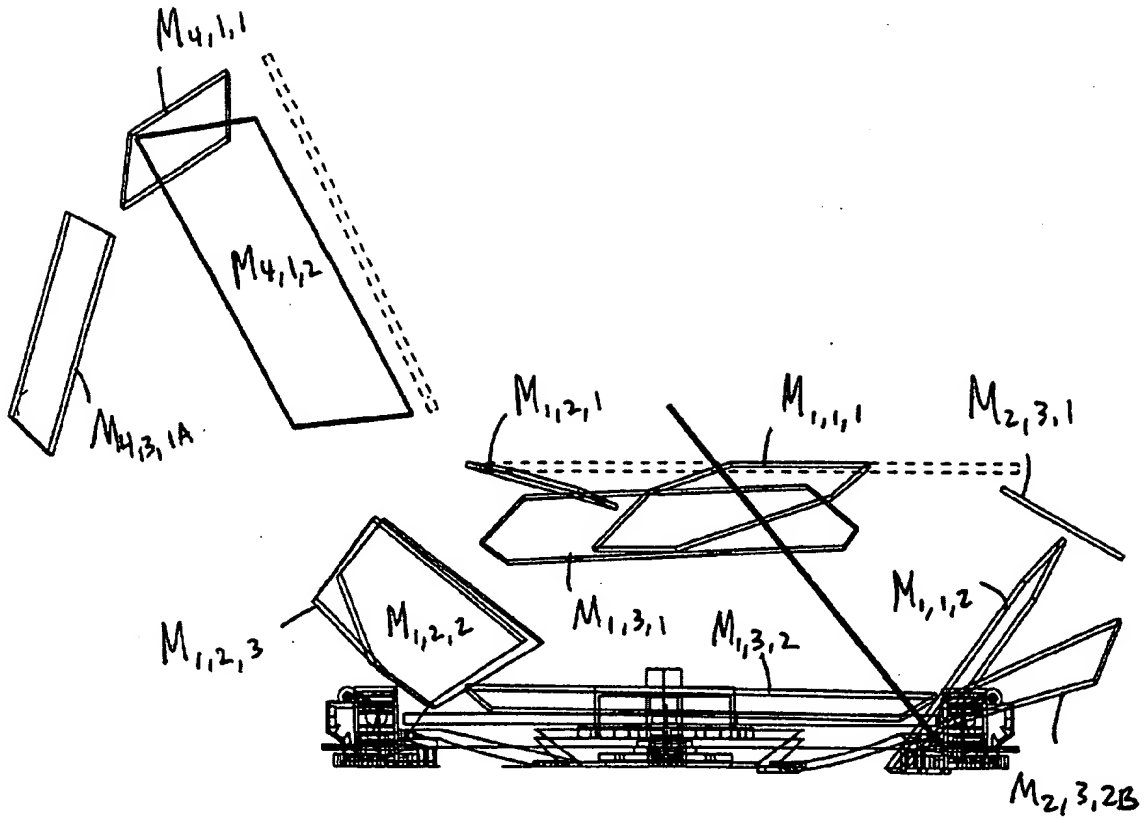


FIG. 2E2

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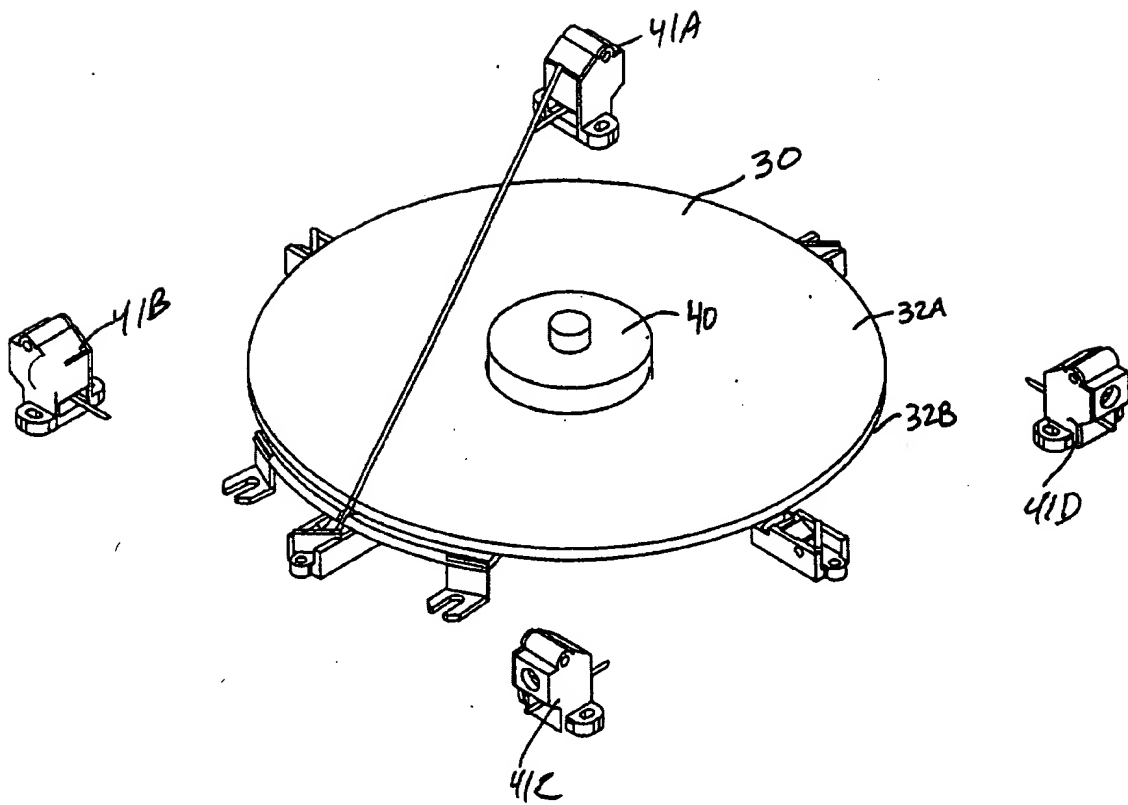


FIG. 2F1

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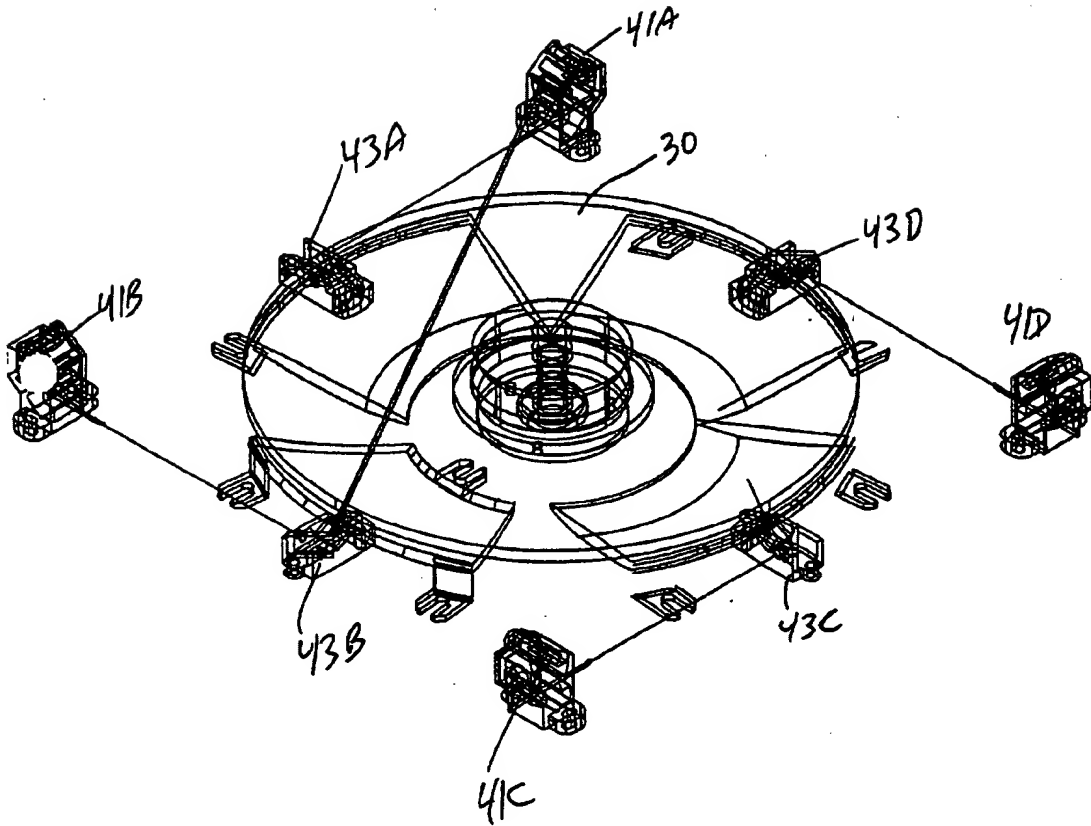
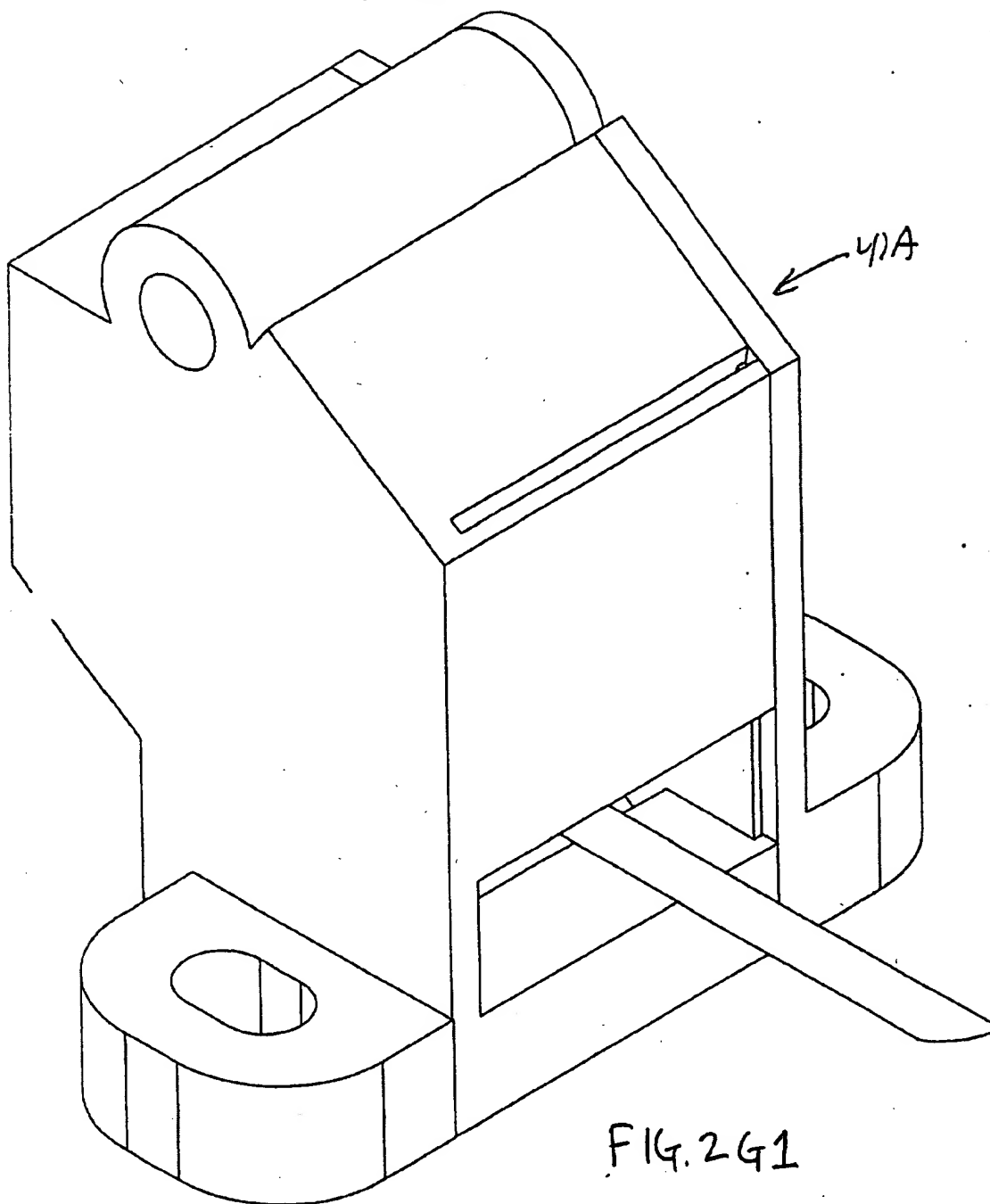


FIG. 2F2

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41A

FIG. 241

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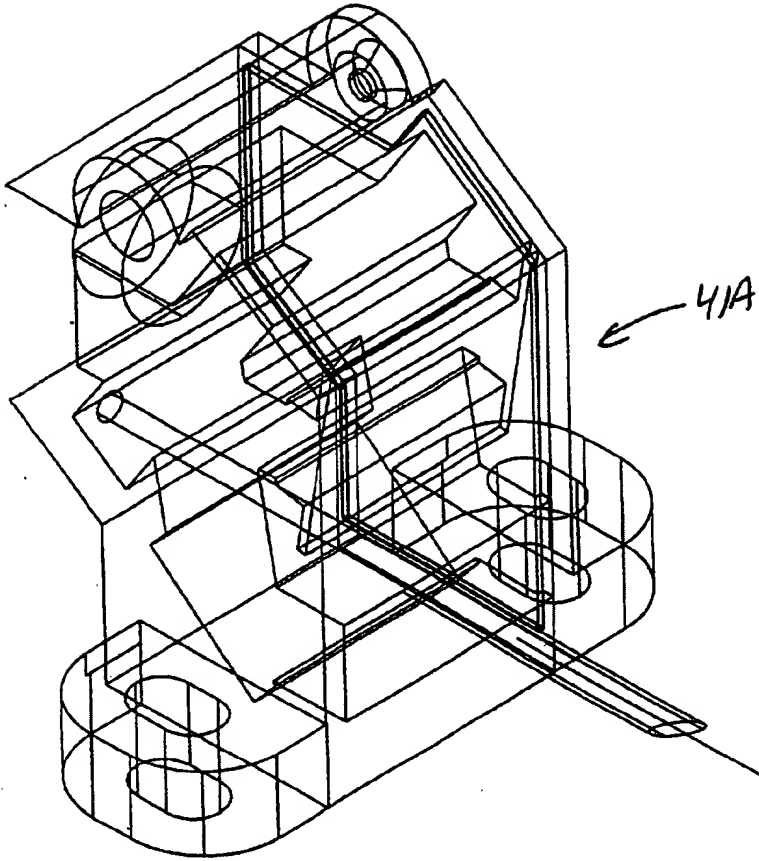
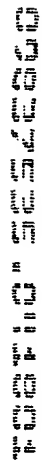


FIG. 2G2

[[[2]]] [[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]
[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]
[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]
[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]	[[[[[2]]]]]

[illegible]

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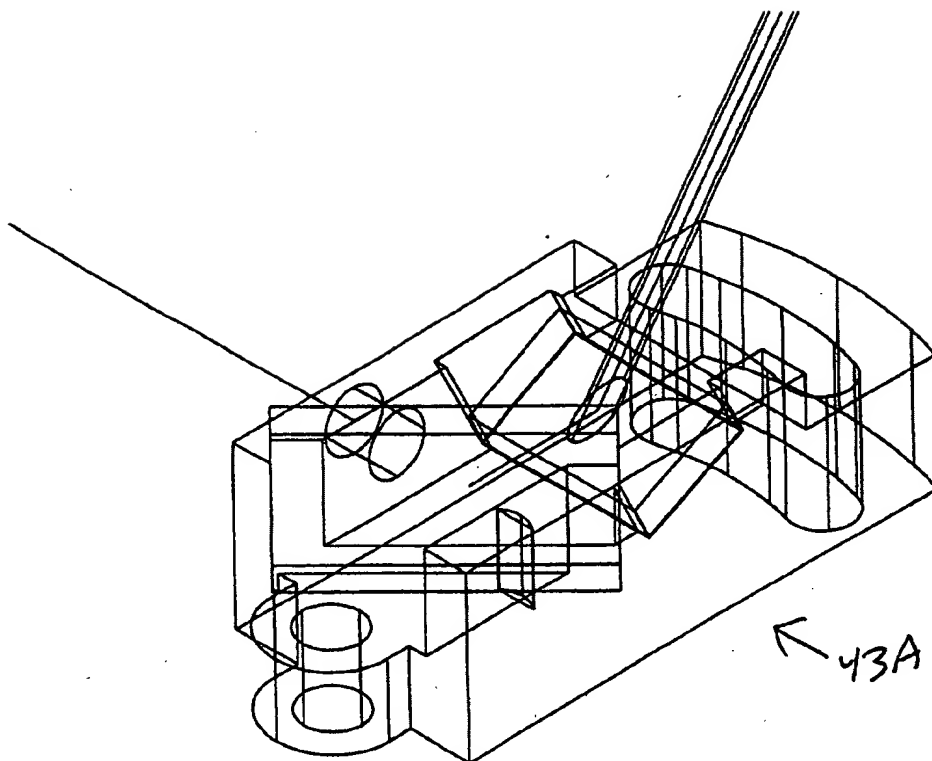


FIG. 2H2

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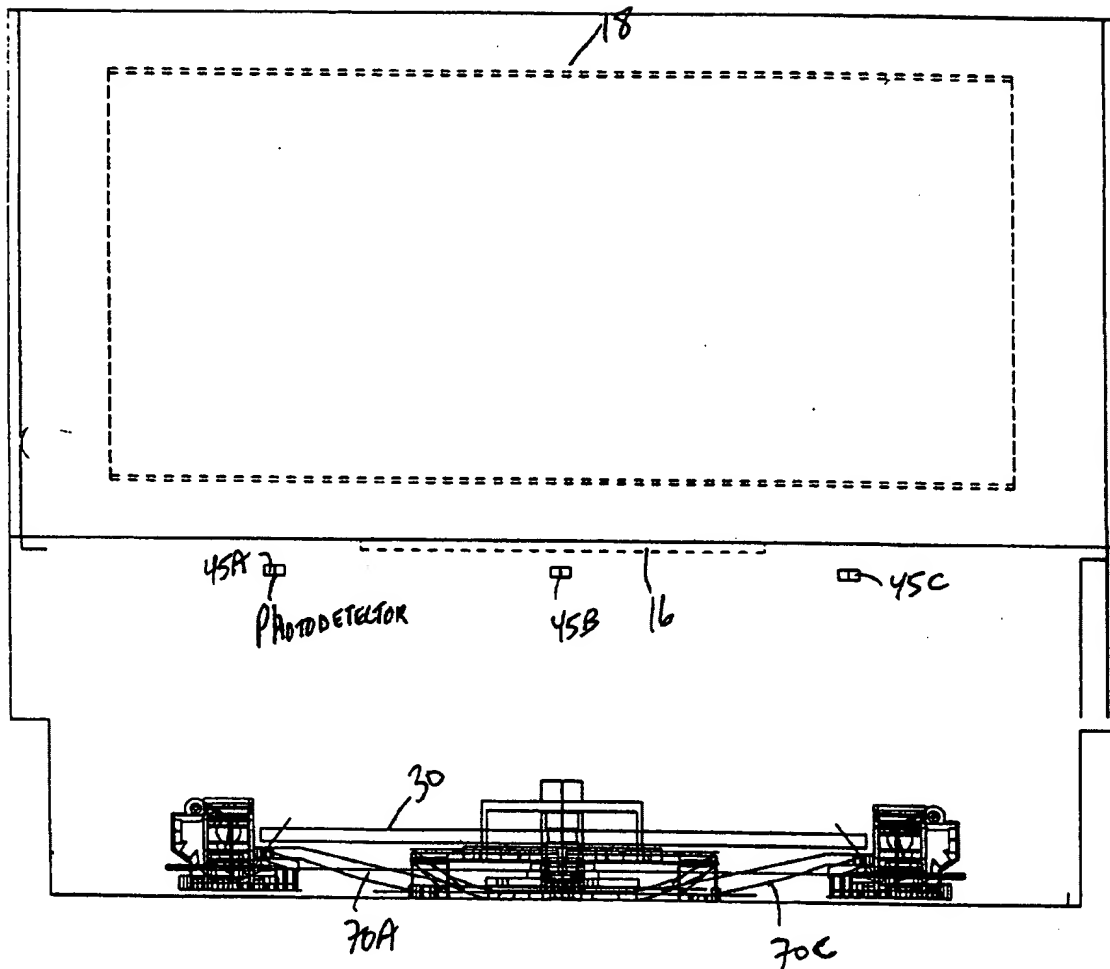


FIG. 2I1

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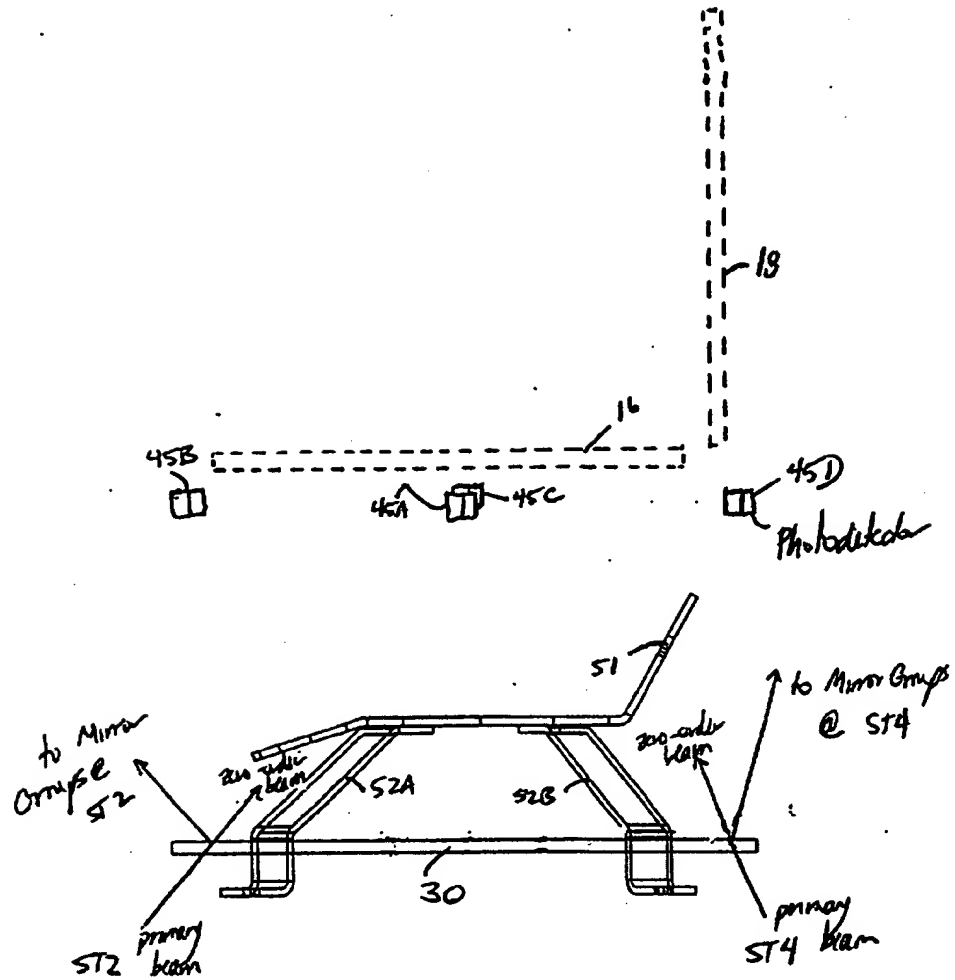


FIG. 2I2

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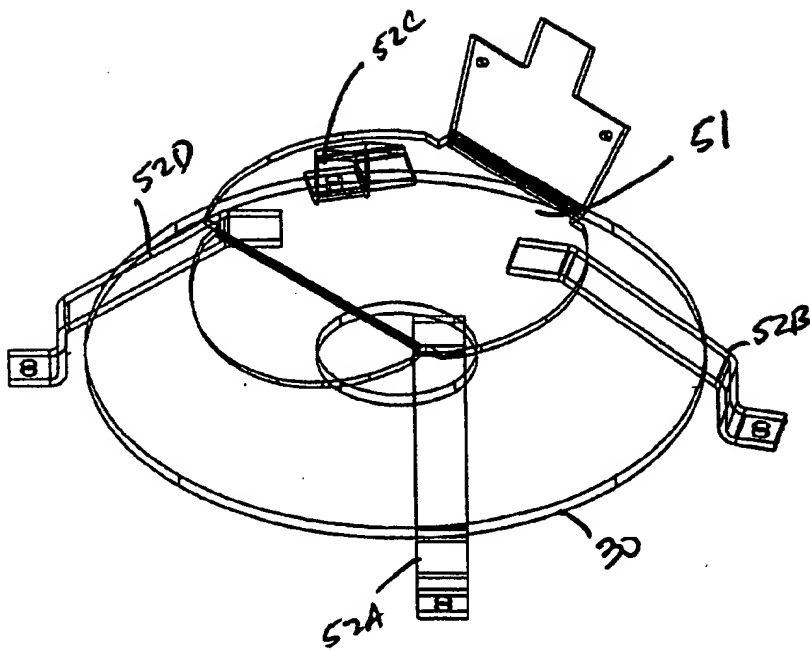


FIG 2I3

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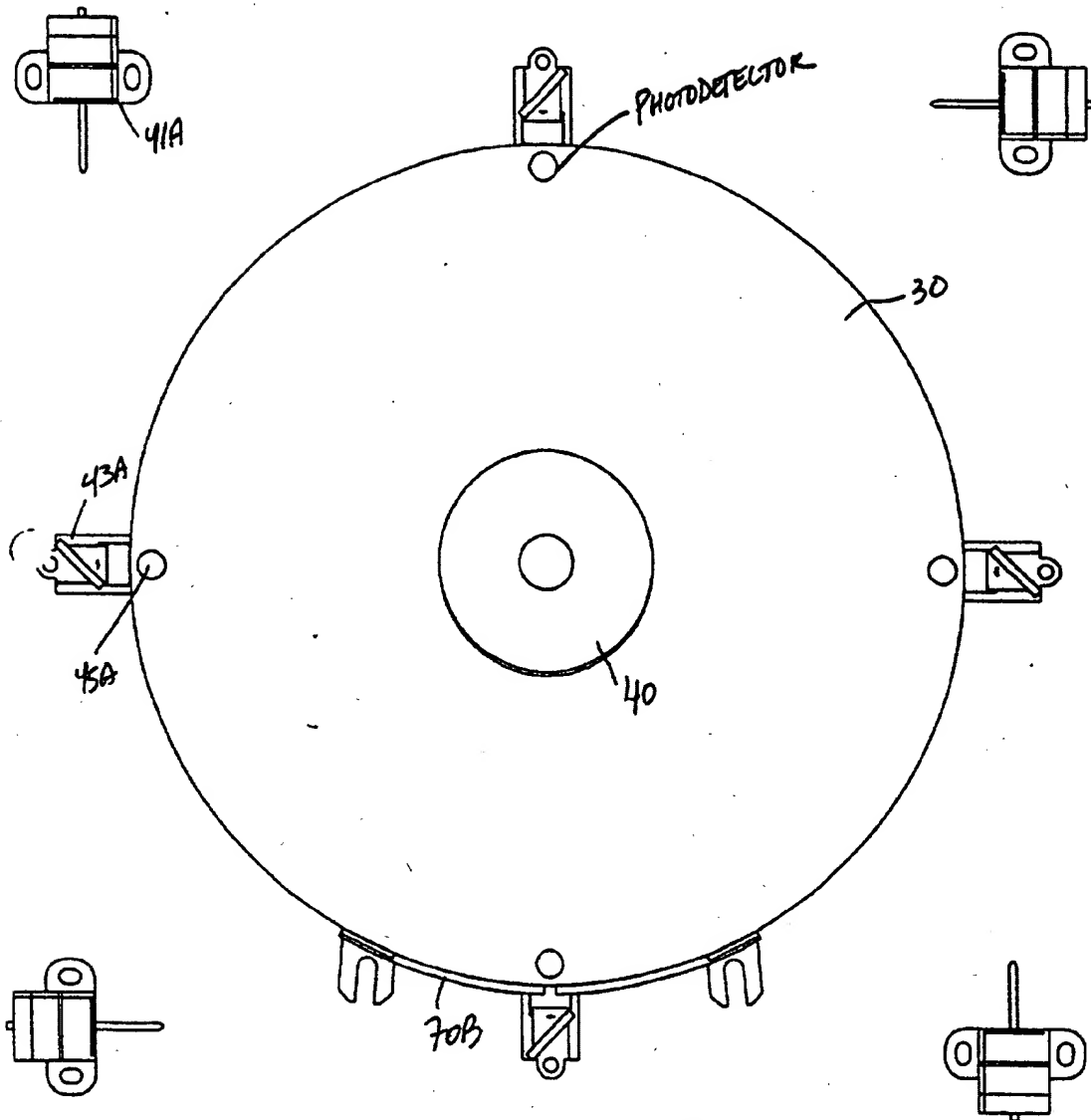


FIG. 2J1

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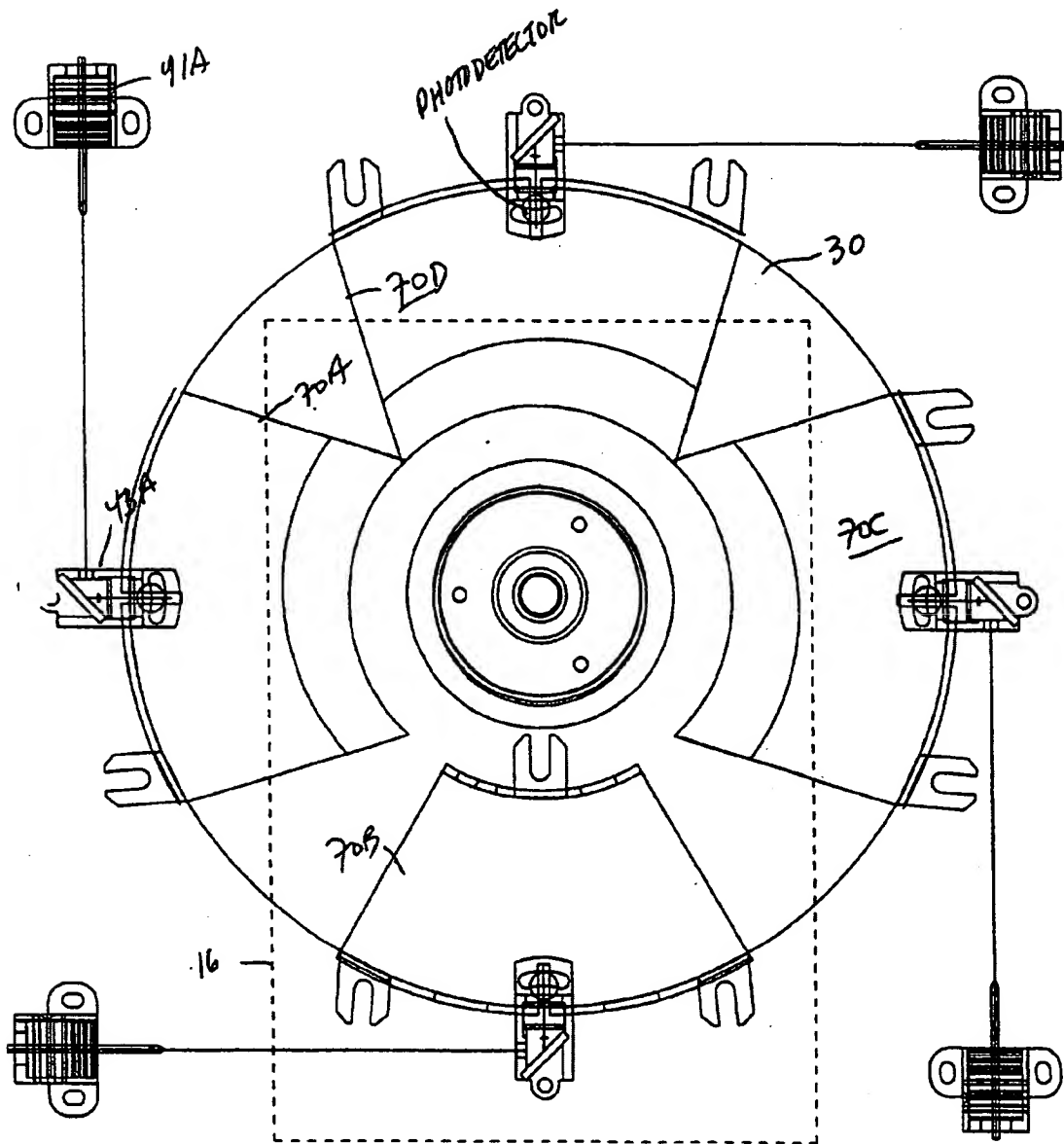


FIG. 2J2

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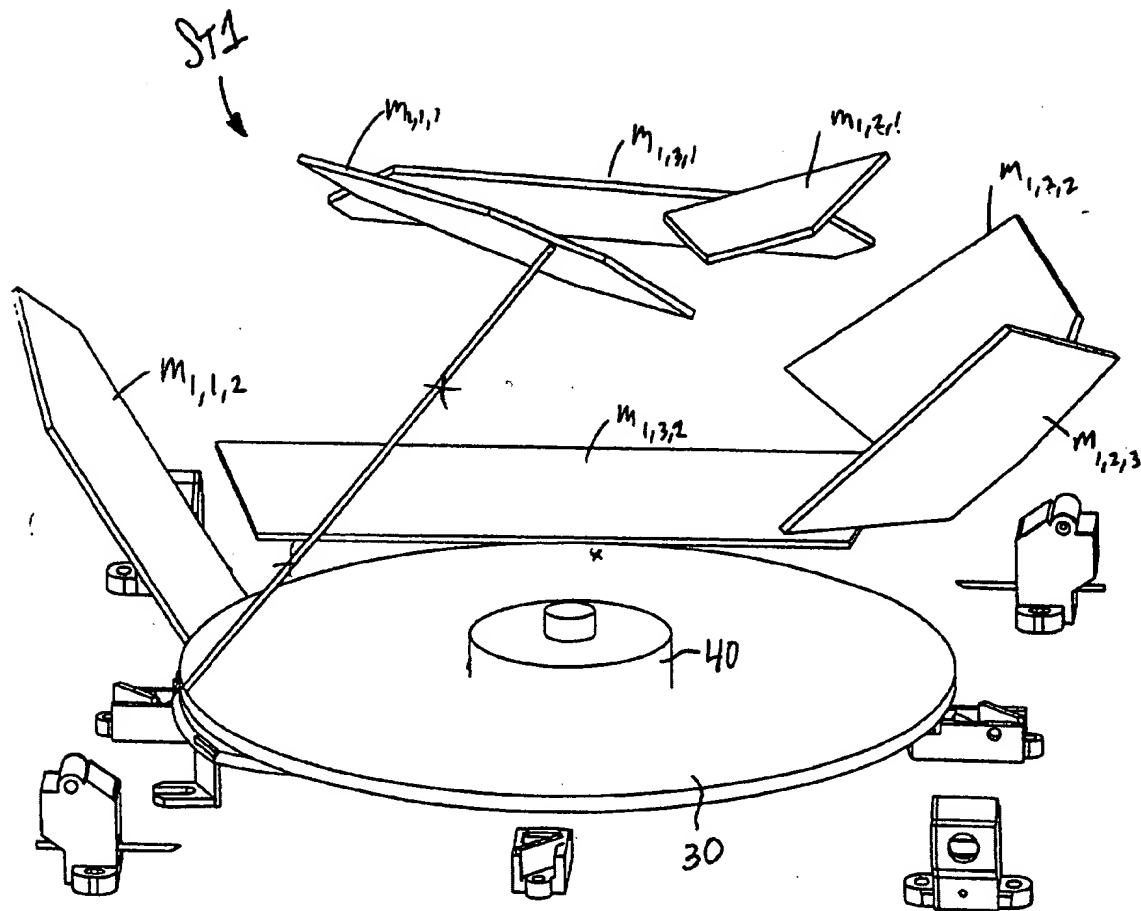


FIG. 2K

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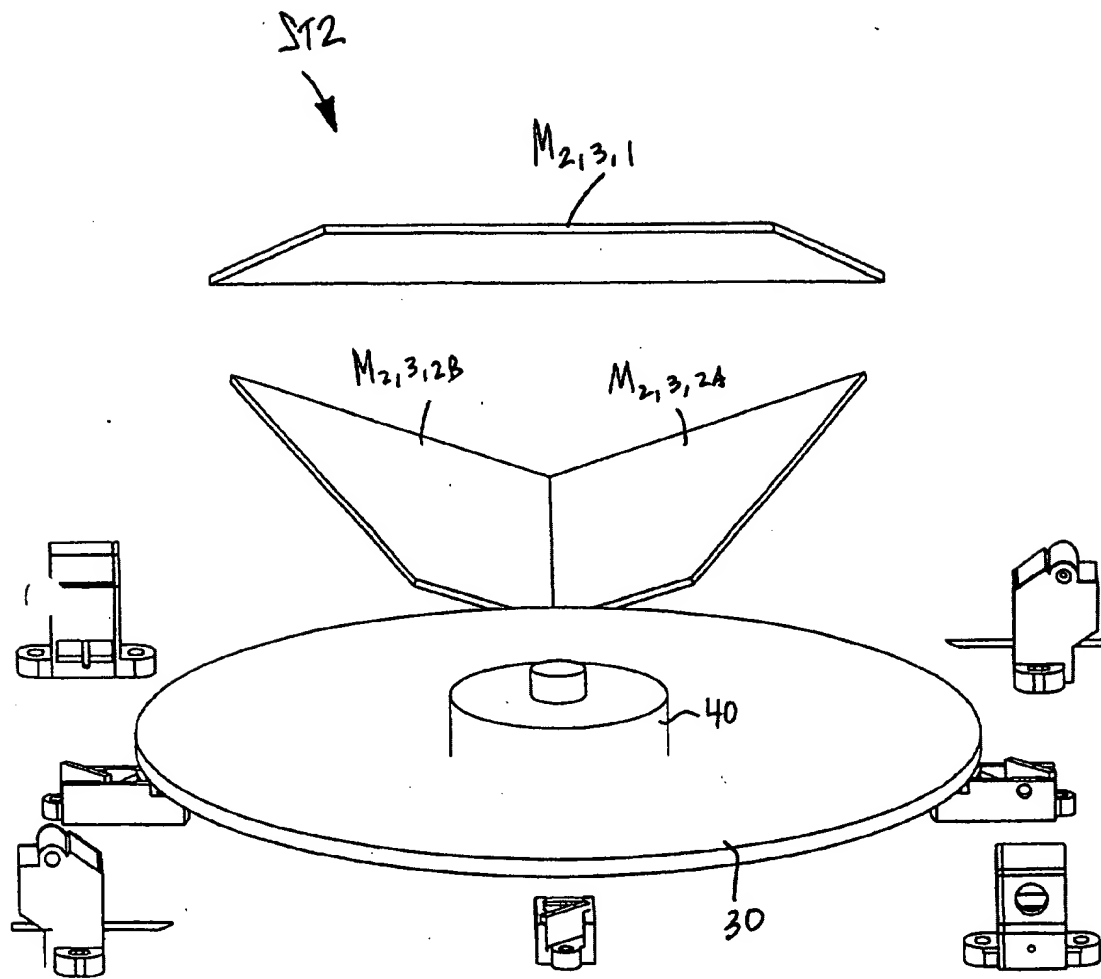


FIG. 2L

STB

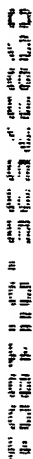


FIG. 2M

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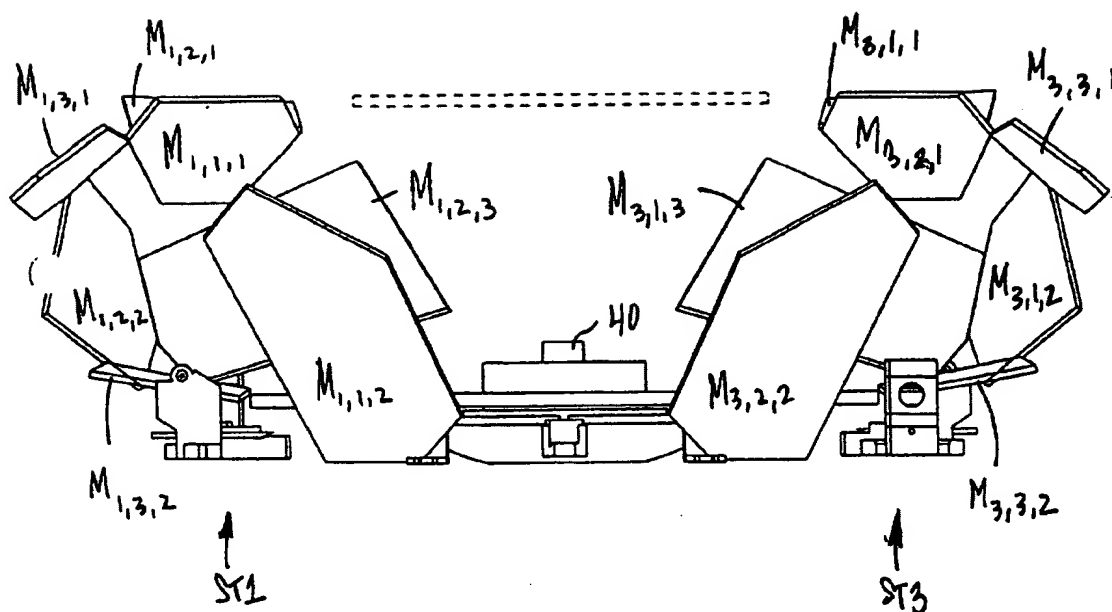


FIG. 2N

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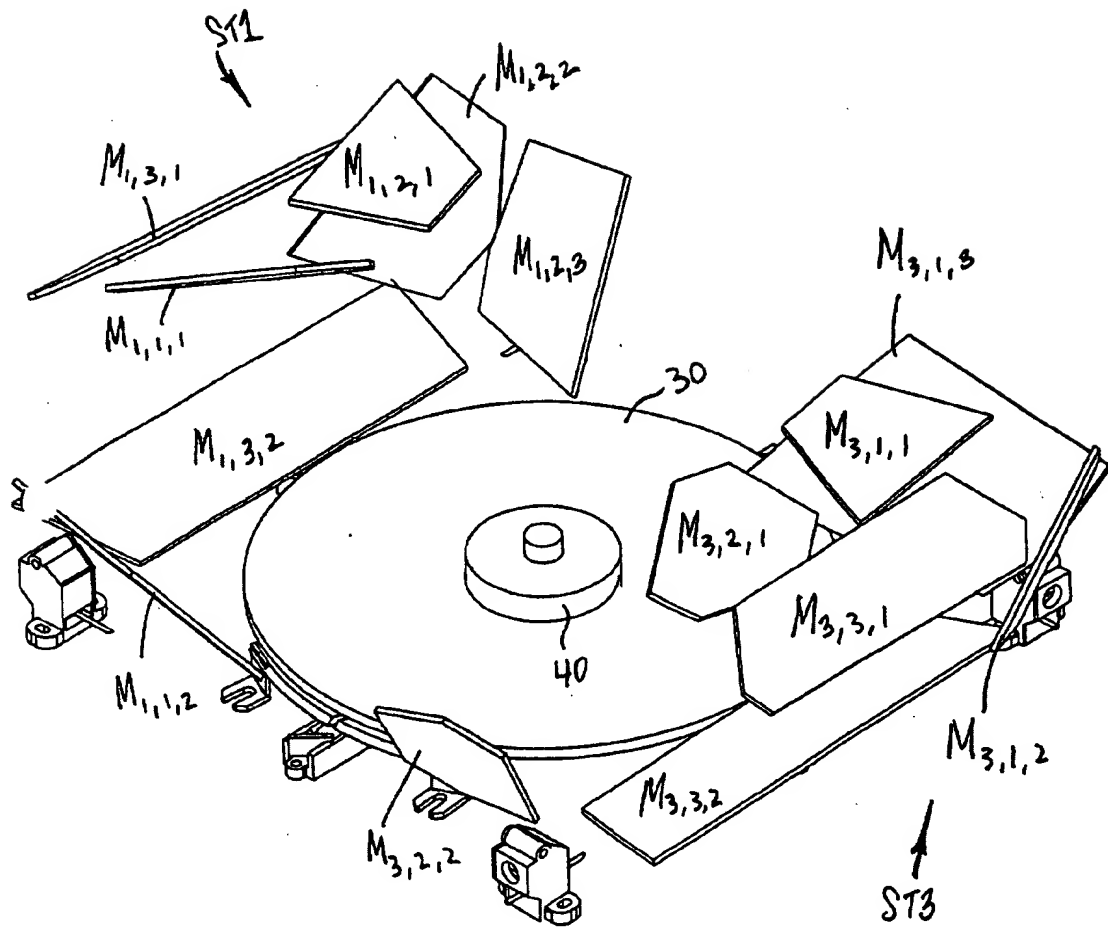


FIG. 20

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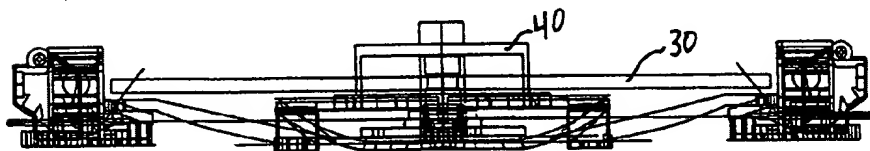
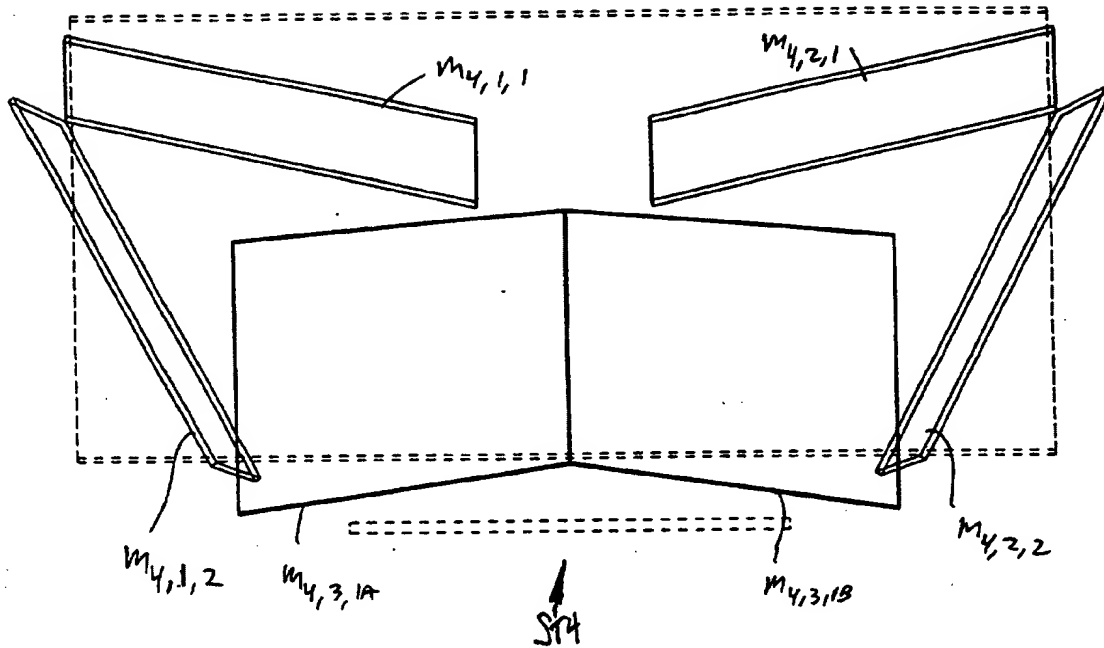


FIG. 2P

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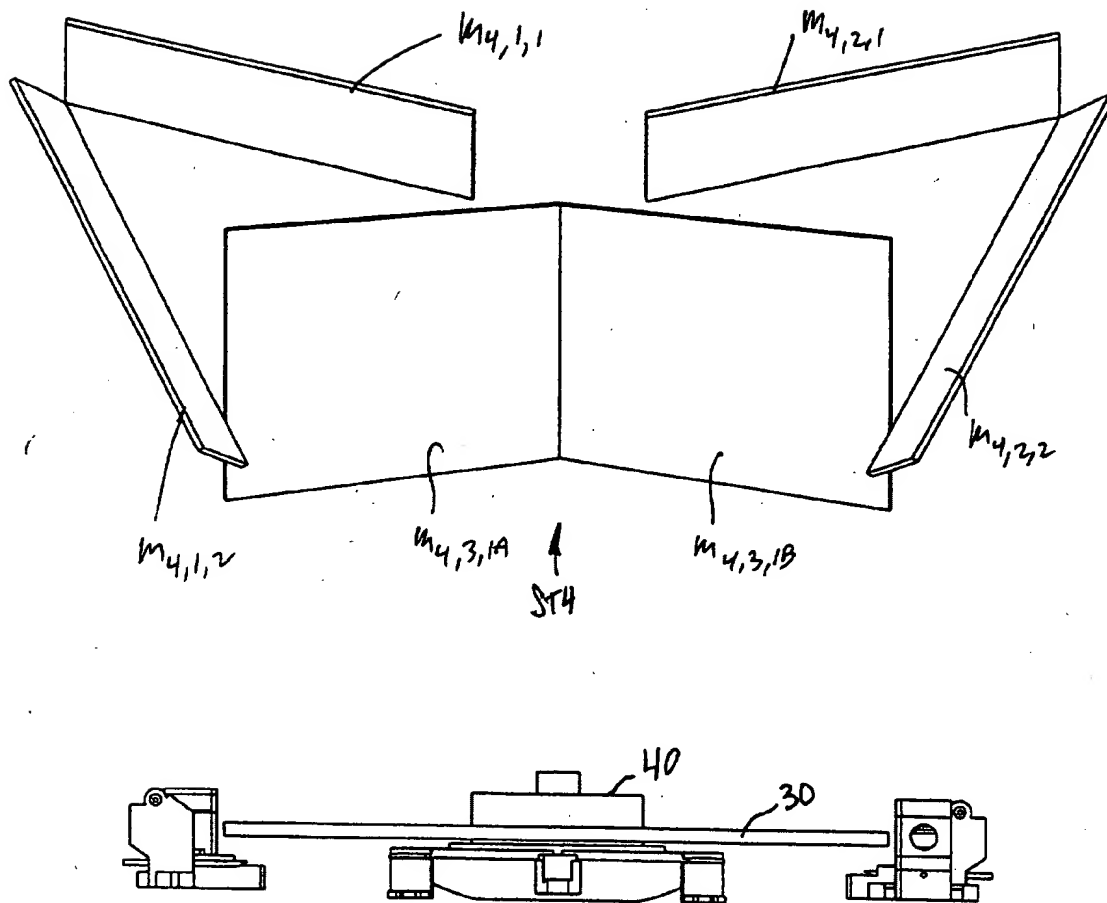


FIG. 2Q

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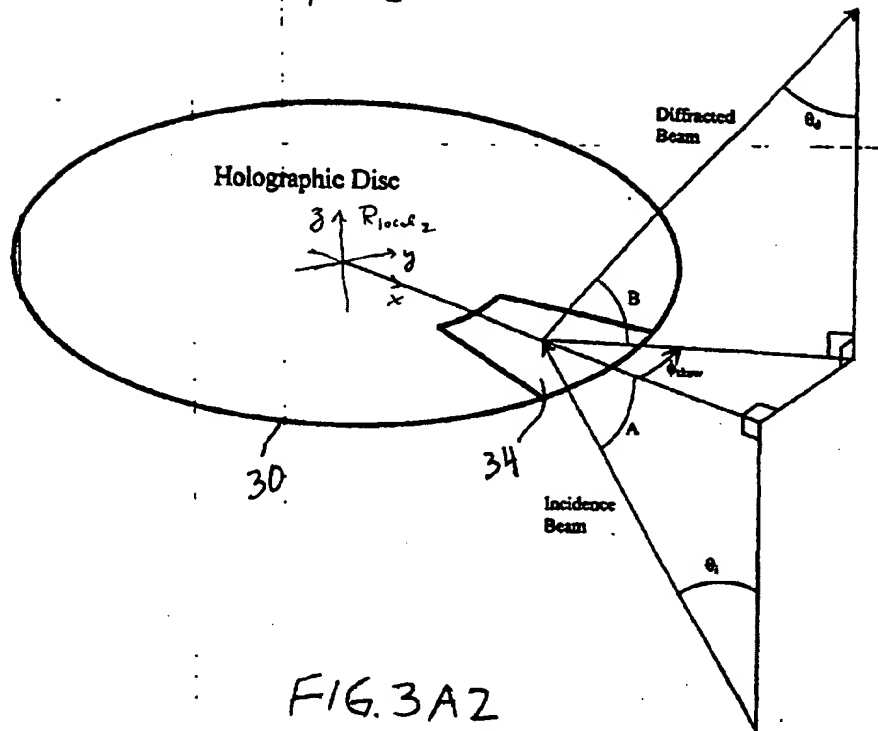


FIG. 3A2

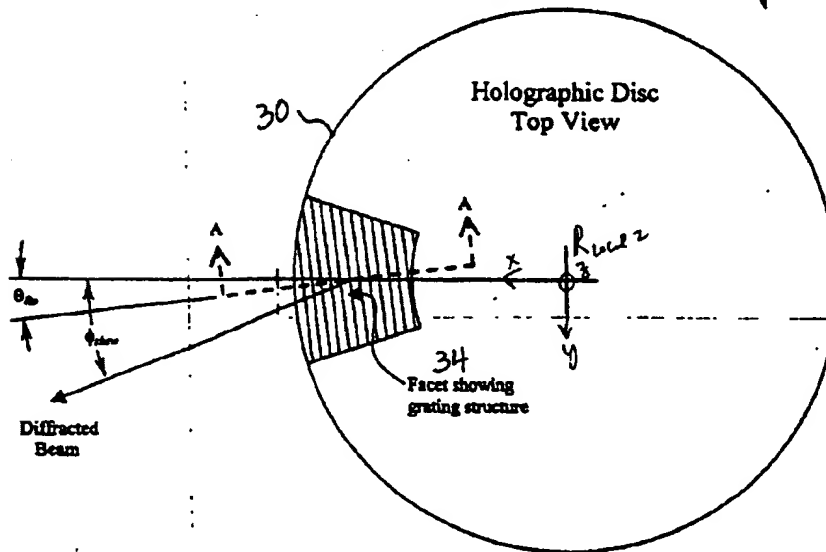


FIG. 3A3

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ELEVATION AND SKEW ANGLE CHARACTERISTICS OF FACETS ON
HOLOGRAPHIC SCANNING DISK OF THE PRESENT INVENTION

FACET GROUP NO.	G1	HIGH ELEVATION ANGLE LEFT SKEW ANGLE	FACET NO.
			7
			9
			11
	G2	HIGH ELEVATION ANGLE RIGHT SKEW ANGLE	FACET NO.
			8
			10
			12
	G3	LOW ELEVATION ANGLE NO/ZERO SKEW ANGLE	FACET NO.
			1
			2
			3
			4
			5
			6

FIG. 3A4

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WG2 @ ST1 MG @ ST1 M @ ST1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Station 1	(Local Co-ordinates)														
2		(Left)														
3	First Mirror	x	y	z												
4		2.55	-1.80	2.70												
5		4.15	-2.27	2.77												
6	$\mu_{1,2,1}$	3.95	0.23	2.05												
7		2.42	-0.24	2.25												
8		2.55	-1.80	2.70												
9																
10																
11																
12	Second Mirror	x	y	z												
13		4.00	-2.63	0.05												
14		4.90	-1.40	0.77												
15	$\mu_{1,2,2}$	4.60	-3.20	2.18												
16		3.70	-4.10	1.06												
17		4.00	-2.63	0.05												
18																
19																
20																
21	Third Mirror	x	y	z												
22		4.41	-4.10	1.10												
23		1.97	-3.30	2.20												
24	$\mu_{1,2,3}$	1.12	-1.60	0.80												
25		2.51	-2.00	0.10												
26		3.53	-2.70	0.10												
27		4.41	-4.10	1.10												
28																

FIG. 3B

Mirror Summary

Mirror Shapes

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MS A 9.2.1.2

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m_2, s, z

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
30																
31	Station 2 (Local Co-ordinates)															
32		Negative skew					Positive Skew					No Skew				No Skew
33	First Mirror	x	y	z		x	y	z		x	y	z				
34										3.75	-1.60	2.51				
35										5.10	-2.40	1.73				
36										5.10	2.40	1.73				
37										3.75	1.60	2.51				
38										3.75	-1.60	2.51				
39																
40																
41																
42	Second Mirror	x	y	z		x	y	z		x	y	z		x	y	z
43										3.00	0.00	-0.11		3.00	0.00	-0.11
44										4.80	0.00	0.38		4.80	0.00	0.38
45										5.07	-2.26	1.07		5.07	-2.26	1.07
46										5.07	-2.26	1.07		5.07	-2.26	1.07
47										3.08	-1.00	0.17		3.08	-1.00	0.17
48										3.00	0.00	-0.11		3.00	0.00	-0.11
49																
50										(Split mirror for generating two sets of horizontal lines)						
51																
52																

FIG. 3C

Mirror Summary

Mirror Shapes

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 DEPARTMENT OF INDUSTRIAL ENGINEERING

MG 20 ST3

MG 10 ST3

MG 30 ST3

$M_{3,3,1}$

$M_{3,3,2}$

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A	B	C	D	E	F	G	H	I	J	K	L
54	Station 3 (Local Co-ordinates)										
55	(1/2) Negative skew										
56	First Mirror	x	y	z	(L) Positive Skew			No Skew			
57		3.80	-2.30	2.77	x	y	z	x	y	z	
58		4.10	-1.88	2.40	2.55	1.80	2.70	4.30	-1.60	2.52	
59		3.80	-0.14	1.80	4.15	2.27	2.77	4.95	-2.15	2.04	
60	$M_{3,3,1}$	3.10	0.80	1.80	3.75	0.95	-0.23	2.05	5.20	-2.00	1.83
61		2.50	0.16	2.45	2.42	0.24	2.25	5.00	1.80	1.66	
62		2.65	-0.76	2.77	2.55	1.80	2.70	4.70	2.10	1.87	
63		3.80	-2.30	2.77				4.10	1.60	2.40	
64								4.30	-1.60	2.52	
65	Second Mirror	x	y	z	x	y	z	x	y	z	
66		1.70	-4.10	1.30	4.00	2.63	0.05	3.10	-2.60	-0.03	
67		3.00	-4.45	1.98	4.90	1.40	0.77	4.50	-3.00	0.22	
68		3.40	-3.99	1.50	4.60	3.20	2.18	4.35	2.30	0.30	
69	$M_{3,3,2}$	2.30	-2.43	-0.63	3.70	4.10	1.06	3.00	2.00	0.04	
70		1.40	-2.57	-0.63	4.00	2.63	0.05	3.10	-2.60	-0.03	
71		1.00	-2.89	-0.20							
72		1.70	-4.10	1.30							
73											
74	Third Mirror	x	y	z	x	y	z				
75					4.41	4.10	1.10				
76					1.97	3.30	2.20				
77					1.12	1.60	0.80				
78					2.51	2.00	0.10				
79					3.53	2.70	0.10				
80					4.41	4.10	1.10				
81											

FIG. 3D

Mirror Summary

Mirror Shapes

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MS 2054 MS 1054 MS 3054

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	
83	Station 4 (Local Co-ordinates)																
84																	
85	First Mirror	Negative skew				Positive Skew				No Skew				No Skew			
86		x	y	z	x	y	z	x	y	z	x	y	z	x	y	z	
87		4.90	-0.80	6.41	4.90	0.80	6.41	6.70	0.00	5.61	6.70	0.00	5.61	6.70	0.00	5.61	
88		6.10	-0.80	5.85	6.10	0.80	5.85	7.40	0.00	3.32	7.40	0.00	3.32	7.40	0.00	3.32	
89		6.00	-4.50	6.47	6.00	4.50	6.47	6.95	-3.00	2.90	6.95	-3.00	2.90	6.95	-3.00	2.90	
90	Second Mirror	4.90	-4.50	7.17	4.90	4.50	7.17	6.20	-3.00	5.34	6.20	-3.00	5.34	6.20	-3.00	5.34	
91		4.90	-0.80	6.41	4.90	0.80	6.41	6.70	0.00	5.61	6.70	0.00	5.61	6.70	0.00	5.61	
92																	
93																	
94																	
95	Second Mirror	x	y	z	x	y	z	x	y	z	x	y	z	x	y	z	
96		2.85	-3.20	3.37	2.85	3.20	3.37	2.85	3.20	3.37	2.85	3.20	3.37	2.85	3.20	3.37	
97		4.20	-2.80	3.23	4.20	2.80	3.23	4.20	2.80	3.23	4.20	2.80	3.23	4.20	2.80	3.23	
98		5.95	-4.50	6.46	5.95	4.50	6.46	5.95	4.50	6.46	5.95	4.50	6.46	5.95	4.50	6.46	
99		4.60	-4.95	6.88	4.60	4.95	6.88	4.60	4.95	6.88	4.60	4.95	6.88	4.60	4.95	6.88	
100	Second Mirror	2.85	-3.20	3.37	2.85	3.20	3.37	2.85	3.20	3.37	2.85	3.20	3.37	2.85	3.20	3.37	

FIG. 3E

Mirror Summary

Mirror Shapes

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Table of I	Dependent Parameters for both the Scanner and the Disk		Dist Str.	4a	Problem Items are
Box height (inches):					
Box width (inches):					
Max angle B (degrees):					
Min angle B (degrees):					
Total facet angular sweep (degrees):					
Min (angle A - angle B) (degrees):					
Max beam speed (inches per second):					
Min beam speed (inches per second):					
Power at data detector (mW):					
Signal voltage (volts):					
Signal voltage at max DOP limits (volts):					
CDRHC: P-avg. Class 27					
YES					
Class 2A?					
YES					
Single pulse					
P-avg. 0.26s					
PASS					
Pulse train correction					
PASS					
IEC:					
Single pulse					
P-avg. 0.26s					
PASS					
Pulse train correction					
PASS					
IEC:					
Single pulse					
P-avg. 0.26s					
PASS					
Pulse train correction					
PASS					
IEC:					
Single pulse					
P-avg. 0.26s					
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Pulse train correction					
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P-avg. 0.26s					
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Pulse train correction					
PASS					
IEC:					
Single pulse					
P-avg. 0.26s					
PASS					
Pulse train correction					
PASS					
IEC:					
Single pulse					

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C. etc.

d = distance from disk to base of scanner (inches):									
Rotational speed of disk (rpm)									
Disk/Stratos Lx's									
Facet	Diffraction (Inches)	Geometrical Focal length (Inches)	Angle A (degrees) Given	Angle B (degrees) Given	Angle of Diffraction (degrees)	Focal plane scan line length (Inches)	Scan Angle (degrees)	Scan mult. Factor (m)	Rotation Angle (degrees)
1	12.5	12.73	52	38.00	52.00	9.750	42.81	1.62	26.24
2	11.5	11.88	52	40.00	50.00	9.750	46.95	1.62	28.35
3	12.7	12.94	52	42.00	48.00	9.750	42.00	1.58	26.66
4	11.5	11.88	52	44.00	46.00	9.750	45.85	1.57	28.19
5	12.7	12.94	52	46.00	44.00	9.750	42.00	1.50	27.87
6	12.0	12.21	52	52.00	38.00	9.750	44.22	1.46	30.28
7	14.7	15.08	52	58.00	32.00	9.750	36.89	1.31	27.99
8	14.7	15.08	52	60.00	30.00	9.750	36.09	1.31	27.99
9	13.5	13.80	52	60.00	30.00	9.750	36.71	1.30	30.65
10	13.5	13.80	52	60.00	30.00	9.750	36.71	1.30	30.65
11	14.8	15.19	52	62.00	28.00	9.750	36.46	1.26	28.19
12	14.8	15.19	52	62.00	28.00	9.750	36.46	1.26	28.19
Accounting for dead time for laser beam 1.15 (degrees)									
Light Collection Factor									
Maximum Collection Area (ignoring notch) (sq. in.)									
1							27.39	1.00	2.28
2							29.50	0.80	1.81
3							27.81	0.92	2.09
4							30.34	0.71	1.62
5							28.12	0.78	1.79
6							31.43	0.64	1.47
7							28.14	0.87	1.97
8							28.14	0.87	1.97
9							31.80	0.71	1.81
10							31.80	0.71	1.81
11							30.34	0.83	1.88
12							30.34	0.83	1.88

FIG. 341

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NOTES: 1. The design of the mirror is subject to change without notice. 2. The design of the mirror is subject to change without notice. 3. The design of the mirror is subject to change without notice.

D. etc.

Notch size in mirror											
TO (12/21/89)											
3.5 mm x 5.1 mm (3.5 mm x 6.5 mm at disk)											
Design	Collection	Area	Beam speed at center of scan line	Beam speed at max depth of field	Beam speed at min depth of field	Beam skew angle	Facet count function	Number of facets	Max freq.	Min freq.	Bandwidth
(includes notch loss of 0.035 sq. inches)			(inches/sec)	(inches/sec)	(inches/sec)	(degrees)	1 = facet 0 = no facet	12			
1			2.27	11052	13704	8400	0	1	0.914	0.560	0.354
2			1.81	10150	12798	7502	0	1	0.853	0.500	0.353
3			2.08	10895	13468	8321	0	1	0.898	0.555	0.343
4			1.83	9858	12429	7286	0	1	0.829	0.486	0.343
5			1.79	10383	12835	7930	0	1	0.856	0.529	0.327
6			1.47	9544	11828	7158	0	1	0.795	0.477	0.318
7			1.97	10482	12834	8351	28	1	0.842	0.557	0.286
8			1.97	10492	12834	8351	-28	1	0.842	0.557	0.286
9			1.82	9524	11640	7407	28	1	0.778	0.494	0.282
10			1.82	9524	11640	7407	-28	1	0.778	0.494	0.282
11			1.68	10068	12108	8027	28	1	0.807	0.535	0.272
12			1.68	10068	12108	8027	-28	1	0.807	0.535	0.272

NOTE: If any entry in these two columns is less than 0.5 degrees (highlighted in red), the corresponding B angle should be changed. This is accomplished by modifying the "Distance from rotational axis" entry for that line (cells G46 to G85).

Angle A - Angle B (Absolute value) (degrees)

FIG. 3G2

[illegible]

Sl. No.	Area (ha)	13.02	Average angle B (degrees)	13.03	Area (ha)	13.04	13.05	13.06	13.07	13.08	13.09	13.10	13.11	13.12	13.13	13.14	13.15	13.16	13.17	13.18	13.19	13.20	13.21	13.22	13.23	13.24	13.25	13.26	13.27	13.28	13.29	13.30	13.31	13.32	13.33	13.34	13.35	13.36	13.37	13.38	13.39	13.40	13.41	13.42	13.43	13.44	13.45	13.46	13.47	13.48	13.49	13.50	13.51	13.52	13.53	13.54	13.55	13.56	13.57	13.58	13.59	13.60	13.61	13.62	13.63	13.64	13.65	13.66	13.67	13.68	13.69	13.70	13.71	13.72	13.73	13.74	13.75	13.76	13.77	13.78	13.79	13.80	13.81	13.82	13.83	13.84	13.85	13.86	13.87	13.88	13.89	13.90	13.91	13.92	13.93	13.94	13.95	13.96	13.97	13.98	13.99	14.00	14.01	14.02	14.03	14.04	14.05	14.06	14.07	14.08	14.09	14.10	14.11	14.12	14.13	14.14	14.15	14.16	14.17	14.18	14.19	14.20	14.21	14.22	14.23	14.24	14.25	14.26	14.27	14.28	14.29	14.30	14.31	14.32	14.33	14.34	14.35	14.36	14.37	14.38	14.39	14.40	14.41	14.42	14.43	14.44	14.45	14.46	14.47	14.48	14.49	14.50	14.51	14.52	14.53	14.54	14.55	14.56	14.57	14.58	14.59	14.60	14.61	14.62	14.63	14.64	14.65	14.66	14.67	14.68	14.69	14.70	14.71	14.72	14.73	14.74	14.75	14.76	14.77	14.78	14.79	14.80	14.81	14.82	14.83	14.84	14.85	14.86	14.87	14.88	14.89	14.90	14.91	14.92	14.93	14.94	14.95	14.96	14.97	14.98	14.99	15.00	15.01	15.02	15.03	15.04	15.05	15.06	15.07	15.08	15.09	15.10	15.11	15.12	15.13	15.14	15.15	15.16	15.17	15.18	15.19	15.20	15.21	15.22	15.23	15.24	15.25	15.26	15.27	15.28	15.29	15.30	15.31	15.32	15.33	15.34	15.35	15.36	15.37	15.38	15.39	15.40	15.41	15.42	15.43	15.44	15.45	15.46	15.47	15.48	15.49	15.50	15.51	15.52	15.53	15.54	15.55	15.56	15.57	15.58	15.59	15.60	15.61	15.62	15.63	15.64	15.65	15.66	15.67	15.68	15.69	15.70	15.71	15.72	15.73	15.74	15.75	15.76	15.77	15.78	15.79	15.80	15.81	15.82	15.83	15.84	15.85	15.86	15.87	15.88	15.89	15.90	15.91	15.92	15.93	15.94	15.95	15.96	15.97	15.98	15.99	16.00	16.01	16.02	16.03	16.04	16.05	16.06	16.07	16.08	16.09	16.10	16.11	16.12	16.13	16.14	16.15	16.16	16.17	16.18	16.19	16.20	16.21	16.22	16.23	16.24	16.25	16.26	16.27	16.28	16.29	16.30	16.31	16.32	16.33	16.34	16.35	16.36	16.37	16.38	16.39	16.40	16.41	16.42	16.43	16.44	16.45	16.46	16.47	16.48	16.49	16.50	16.51	16.52	16.53	16.54	16.55	16.56	16.57	16.58	16.59	16.60	16.61	16.62	16.63	16.64	16.65	16.66	16.67	16.68	16.69
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FIG. 3H

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Disk Str. 19

*** Modified Exposure Angles to Correct for Post-processing Residual Geolastic Swell ***												
DataSeries: 4.1a		Percent gelatin swell (from measurements)		delta-Vt		20%		650 nm				
Fact	Exposure angles at 488 nm		Exposure angles to compensate for swell		gamma(uv)	A	B	C	Z	alpha-0	beta-0	
	Reference Beam (degrees)	Object Beam (degrees)	Reference Beam (degrees)	Object Beam (degrees)								
1	26.13	34.99	23.85	40.50	-4.08	-4.90	1.98	0.17	0.69	0.26	25.12	
2	26.45	37.42	24.34	38.70	-3.64	-4.25	1.99	0.16	0.68	0.27	24.12	
3	26.78	35.62	24.53	34.88	-2.99	-3.88	1.99	0.12	0.67	0.27	19.93	
4	26.55	34.20	25.55	35.04	-2.81	-2.90	1.98	0.28	0.68	0.28	22.04	
5	28.12	41.20	28.41	31.31	-1.22	-1.48	2.00	0.05	0.63	0.29	19.86	
6	26.81	30.80	26.81	27.53	0.90	0.90	2.00	0.30	0.60	0.30	17.58	
7	27.53	27.53	27.53	27.53	1.92	2.31	2.00	-0.08	0.56	0.32	14.03	
8	26.64	22.38	26.64	21.77	1.92	2.31	2.00	-0.08	0.56	0.32	18.65	
9	29.02	20.64	29.02	19.83	2.48	3.10	1.99	-0.11	0.55	0.33	12.81	
10	29.02	20.64	29.02	19.83	2.48	3.10	1.99	-0.11	0.55	0.33	19.01	
11	18.69	30.50	17.89	30.50	3.25	3.90	1.99	-0.14	0.53	0.32	19.37	
12	18.68	30.50	17.89	30.50	3.25	3.90	1.99	-0.14	0.53	0.32	11.58	

FIG. 31

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L .atos_4

*** Analysis of the Focus Shift and Out-of-focus Spot Size for Converging Reference Beam *** (Not applicable for Simios)											
Convergence of the reference beam:			-1477 mm								
Focal length of parabolic mirror:			58.82 mm								
Distance from parabolic mirror to detector:			60 mm								
Facet	Design Focal length (mm)	Per. Mirror Eff. width (mm)	Required foc. length (mm)	Object distance (mm)	Image distance (mm)	Image shift (mm)	Spot size at detector (mm)				
1	317.50		40 404.42	-14854.75	58.05	-0.95	0.54	Distance (Cell E821) may have to be adjusted so that the maximum spot size at the detector is approximately the same when the 1/2 depth of field value is negative as it is when the 1/2 depth of field value is positive. (The 1/2 depth of field value is located at Cell G19)			
2	292.10		40 364.09	31841.43	58.71	-1.29	0.58				
3	322.58		40 412.59	-11828.19	58.11	-0.89	0.50				
4	292.10		40 364.09	31841.43	58.71	-1.29	0.58				
5	322.58		40 412.59	-11828.19	58.11	-0.89	0.50				
6	304.80		40 384.03	-48330.78	58.89	-1.11	0.75				
7	373.38		40 499.87	-4485.04	58.60	-0.40	0.27				
8	342.90		40 446.55	-6818.28	59.33	-0.87	0.45				
10	342.90		40 446.55	-6818.28	59.33	-0.87	0.45				
11	375.92		40 504.23	-4375.15	59.62	-0.38	0.25				
12	375.92		40 504.23	-4375.15	59.62	-0.38	0.25				

FIG. 3J

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Focal distances and distances to the window for the Stratos scanner
 LDD 12/7/99 RPH

Facet	Diffraction Focal length (inches) Given	Distance to			Operator side		
		horizontal window (inches)	Difference (inches)	vertical window (inches)	horizontal window (inches)	Difference (inches)	
1	12.5	8.5	4	10.2	2.3	8	4.5
2	11.5	8.8	2.7	10.2	1.3	8.42	3.08
3	12.7	9.2	3.5	10.2	2.5	8.85	3.85
4	11.5	9.5	2	10.2	1.3	9.25	2.25
5	12.7	9.8	2.9	10.2	2.5	9.7	3
6	12	10.2	1.8	10.2	1.8	10.1	1.9
7	14.7	10.6	4.1	14.1	0.6		
8	14.7	9.7	5	14.1	0.6		
9	13.5	11.2	2.3	13.8	-0.3		
10	13.5	9.8	3.7	13.8	-0.3		
11	14.8	11.1	3.7	13.6	1.2		
12	14.8	9.6	5.2	13.6	1.2		

The horizontal window lines from the even numbered vertical facets 8, 10, 12 are near the vertical window.

FIG. 3K

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* CDRH/IEC Calculations to Verify that the Scanner Meets Class Requirements ***									
The number of overlapping lines (N-overlap) must be determined from the scanner data.									
A safe assumption for our scanners is to consider that two scan lines are overlapped									
ONLY when the difference between their diffraction angles (B) is less than 2 degrees.									
All else being equal, the slowest scan lines (largest angle B) will be the worst case scan lines.									
N-overlap:	1								
Motor speed (rpm):				5200					
Alpha-min (radians):				0.0016	(from standard)				
FWHM P-divergence of laser (deg.):				8	(Linked from Trmc spreadsheet)				
FWHM S-divergence of laser (deg.):				30	(Linked from Trmc spreadsheet)				
Focal length of collimating lens (mm):				6.1	(Linked from Trmc spreadsheet)				
Angle of incidence at MIF plate (deg.):				29.23					
Angle of diffraction at MIF plate (deg.):				42.12					
X-p (mm):				0.87					
X-s (mm):				3.93					
Average source dimension (mm):				2.40					
Distance to aperture (mm):				200	(actual distance or 200 mm, whichever is greater)				
Alpha (radians):				0.012					
C6:				7.996					
Laser power at window (mW)									
Facet									Facet count
1	0.86	3.95856E-05	3.95856E-05	3.95856E-05	0.0000339				1
2	0.86	3.96549E-05	3.96549E-05	3.96549E-05	0.0000341				1
3	0.86	4.08001E-05	4.08001E-05	4.08001E-05	0.0000351				1
4	0.86	4.08315E-05	4.08315E-05	4.08315E-05	0.0000362				1
5	0.86	4.28115E-05	4.28115E-05	4.28115E-05	0.0000370				1
6	0.87	4.40086E-05	4.40086E-05	4.40086E-05	0.0000381				1
7	0.87	4.90358E-05	4.90358E-05	4.90358E-05	0.0000425				1
8	0.87	4.90358E-05	4.90358E-05	4.90358E-05	0.0000425				1
9	0.87	4.96126E-05	4.96126E-05	4.96126E-05	0.0000430				1
10	0.87	4.96126E-05	4.96126E-05	4.96126E-05	0.0000430				1
11	0.87	5.14525E-05	5.14525E-05	5.14525E-05	0.0000446				1
12	0.87	5.14525E-05	5.14525E-05	5.14525E-05	0.0000446				1

FIG. 3L1

Fig. 3L2

Fig. 3L2

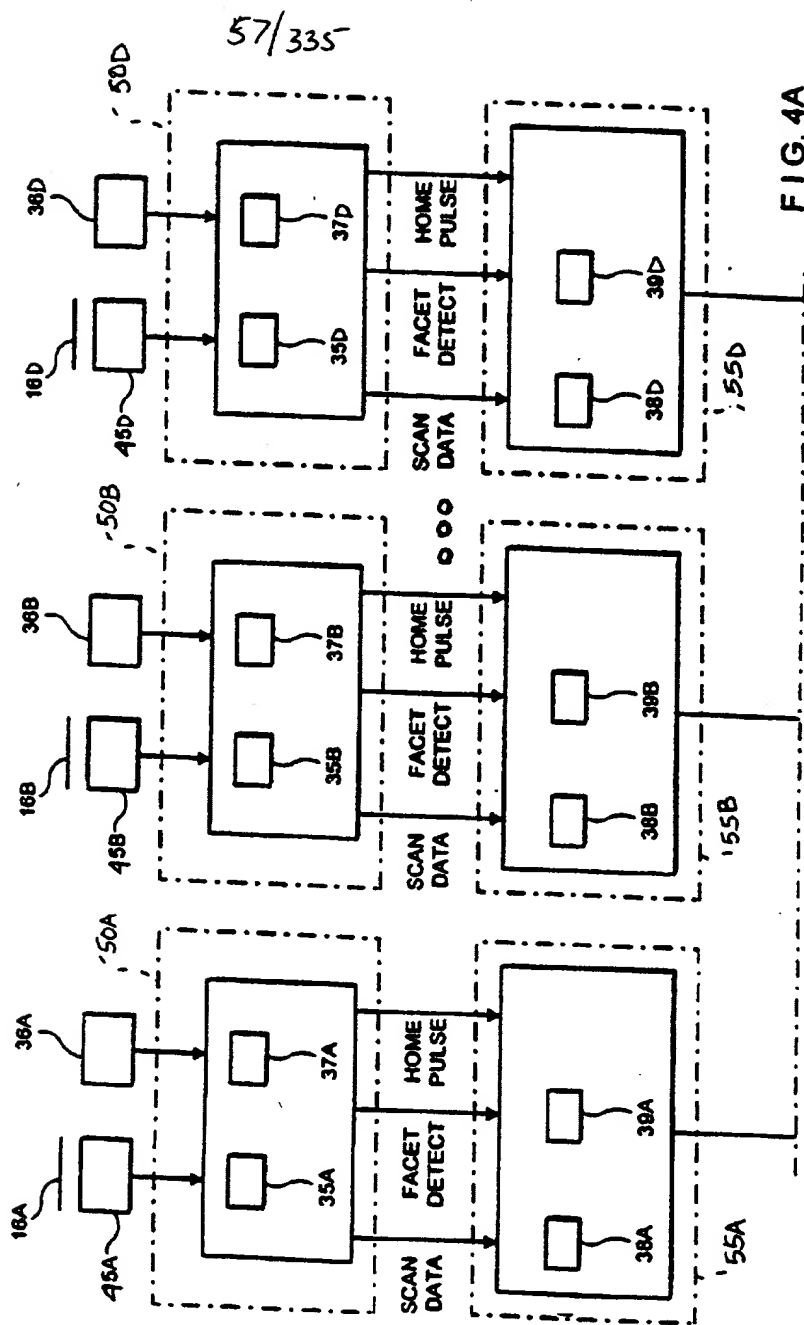


FIG. 4A

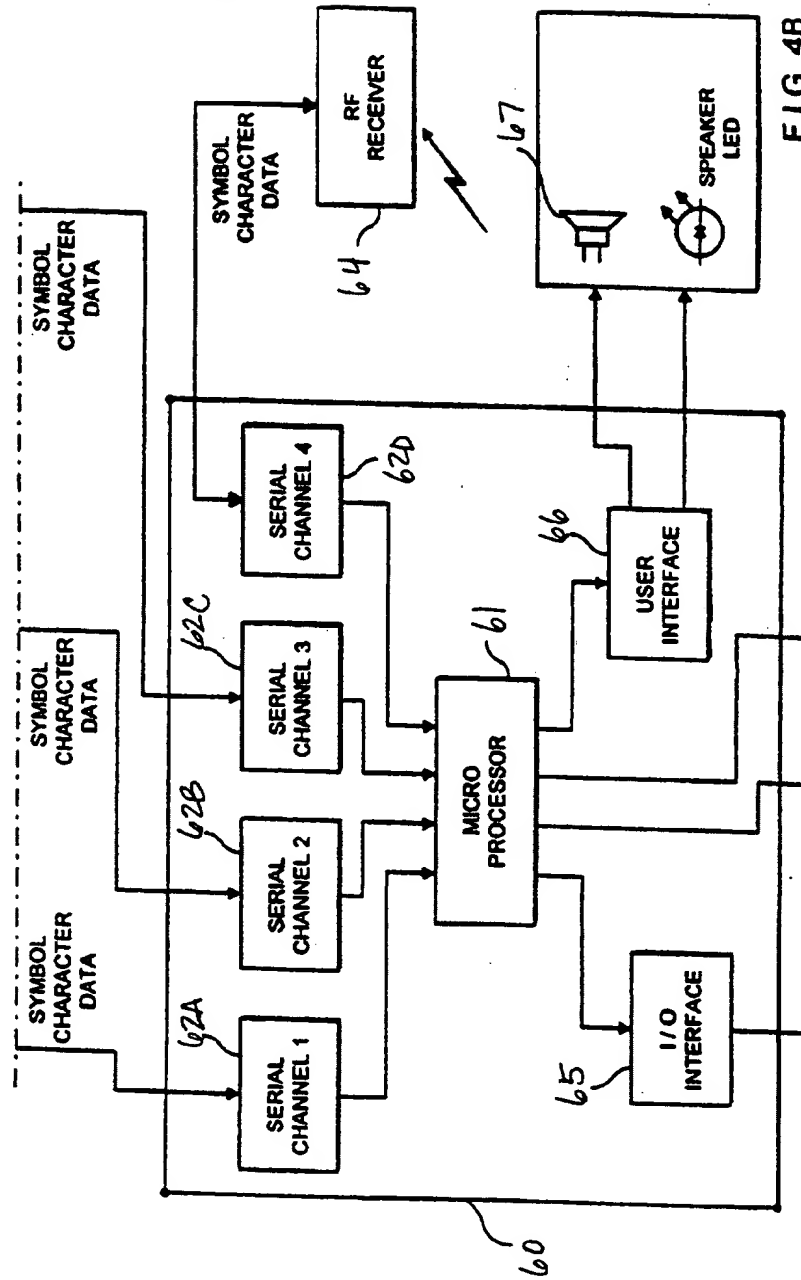


FIG. 4B

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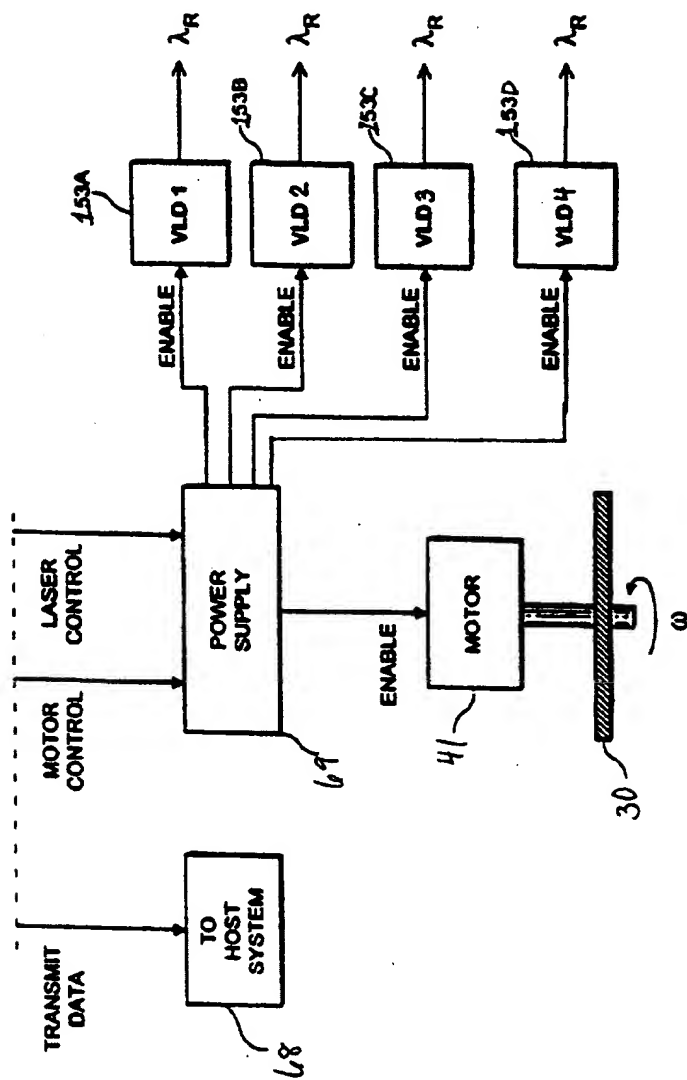


FIG. 4C

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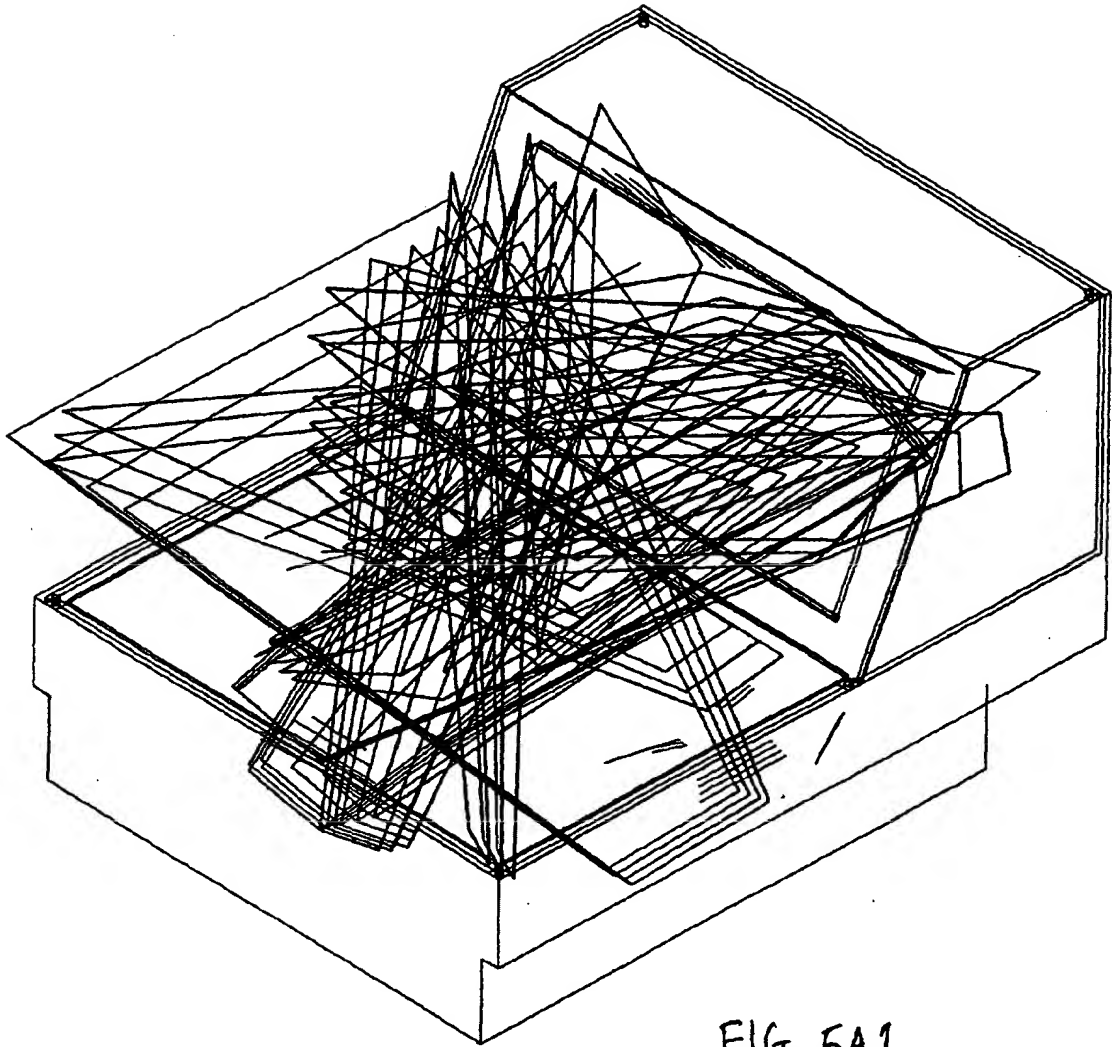


FIG. 5A1

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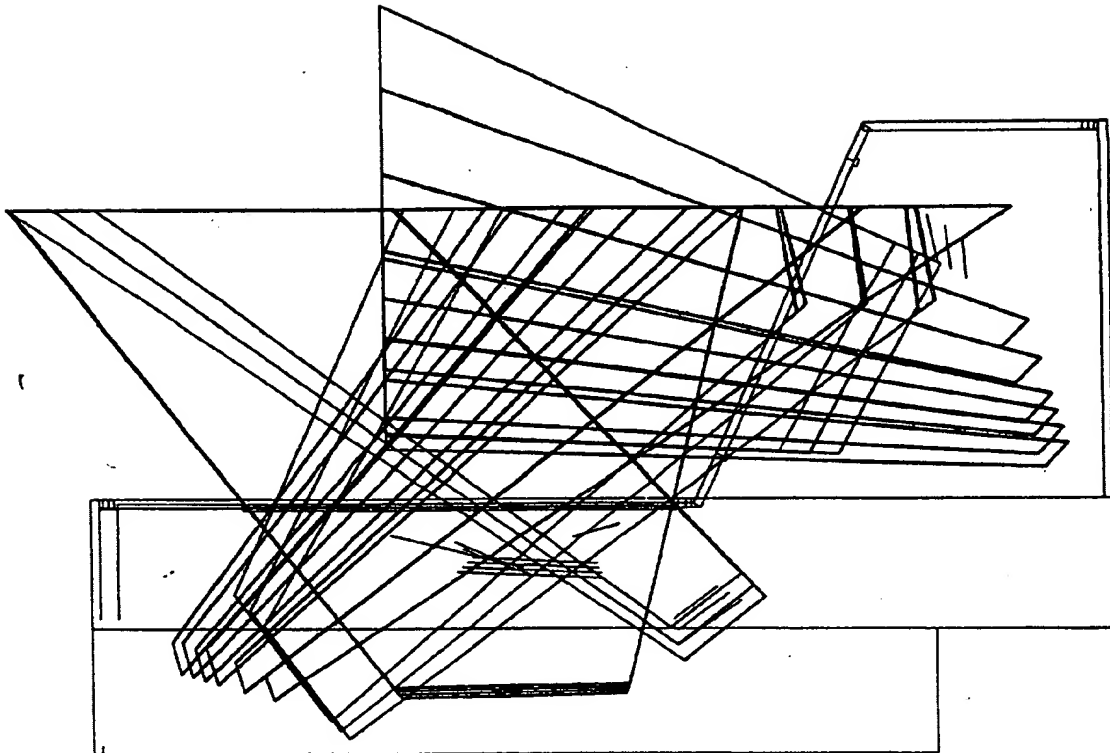


FIG. 5A2

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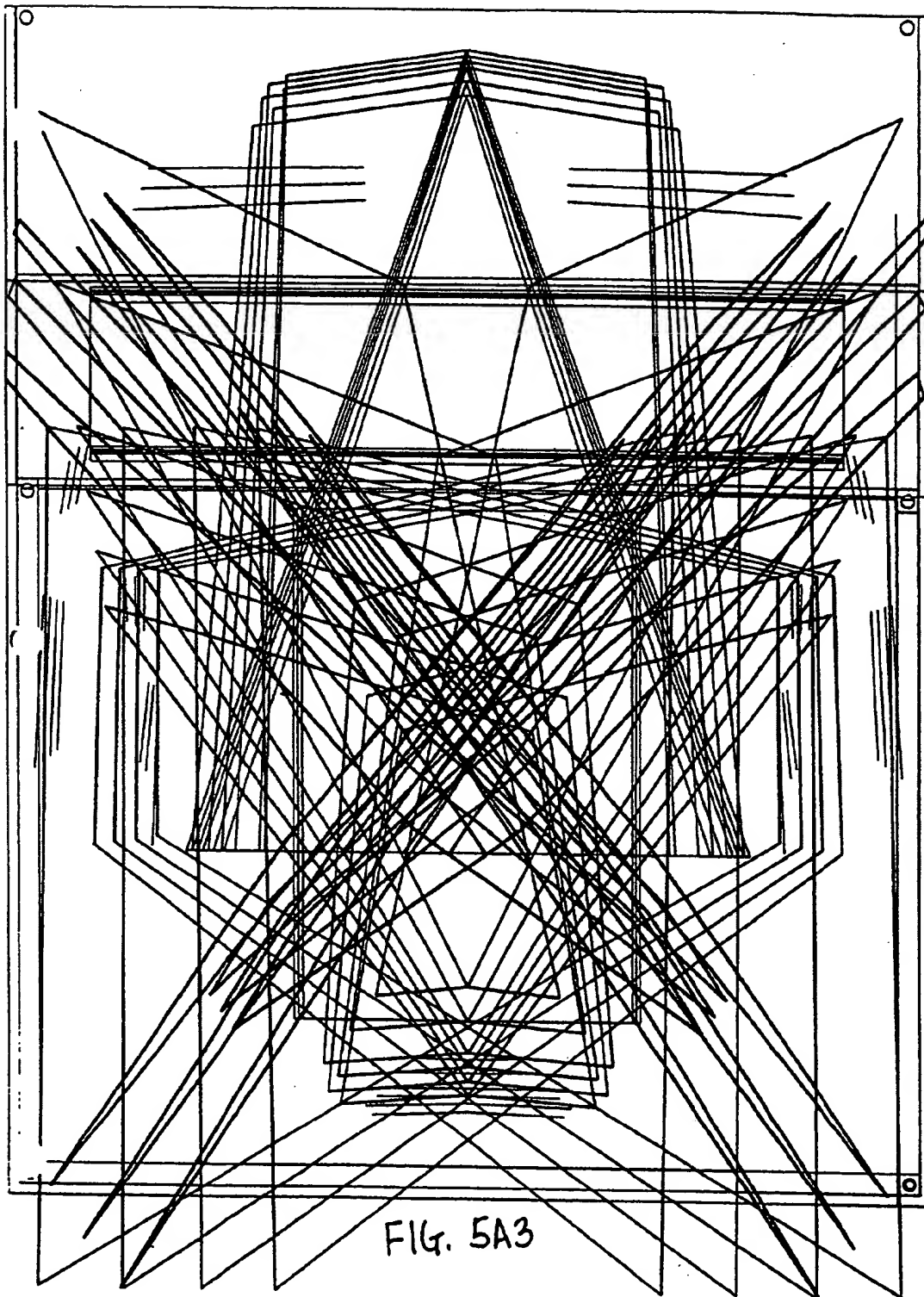
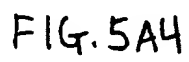


FIG. 5A3

[illegible]

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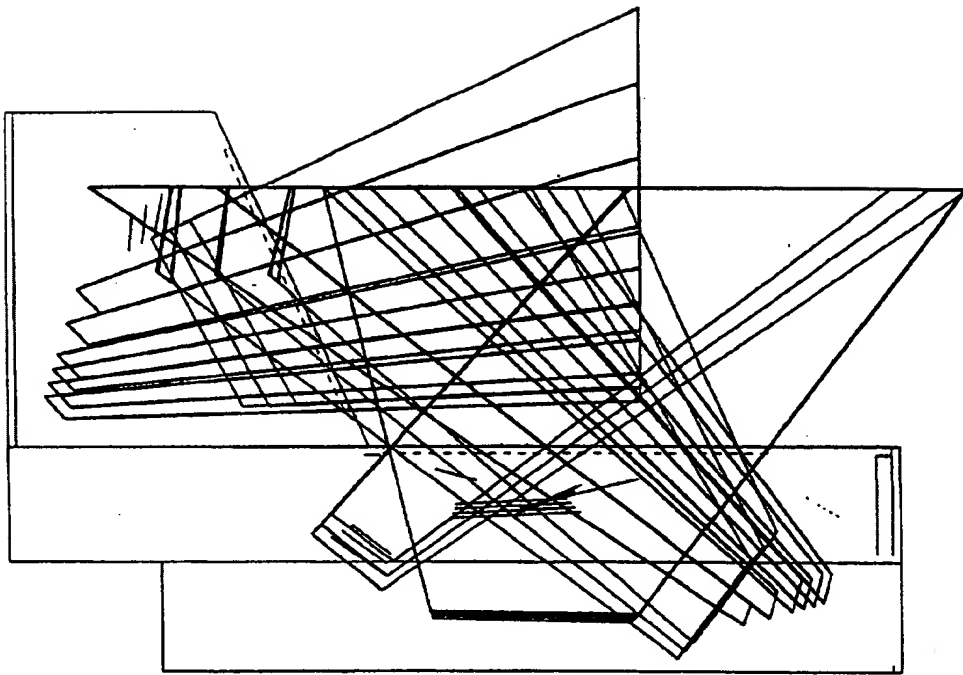


FIG. 5A5

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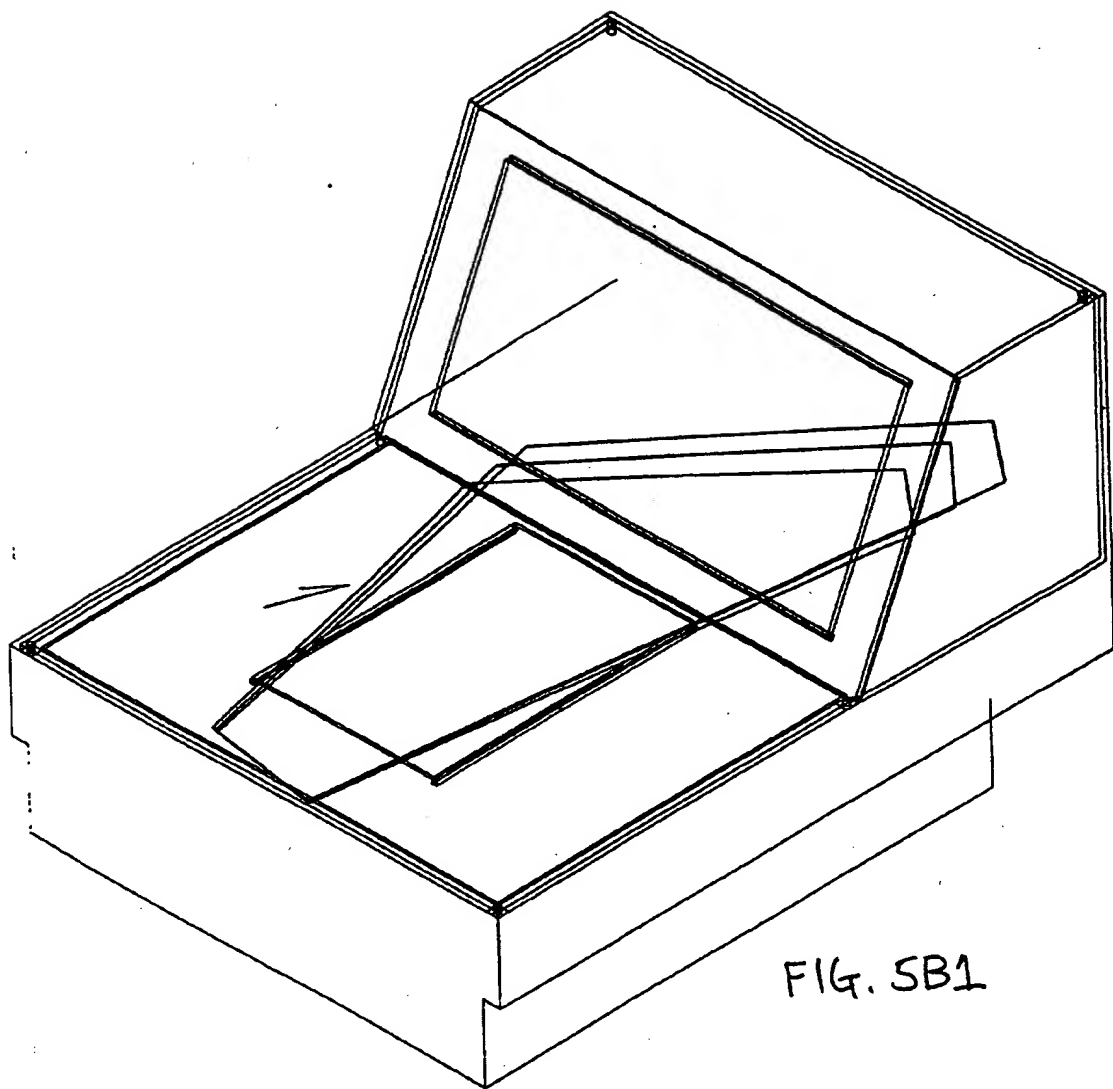


FIG. 5B1

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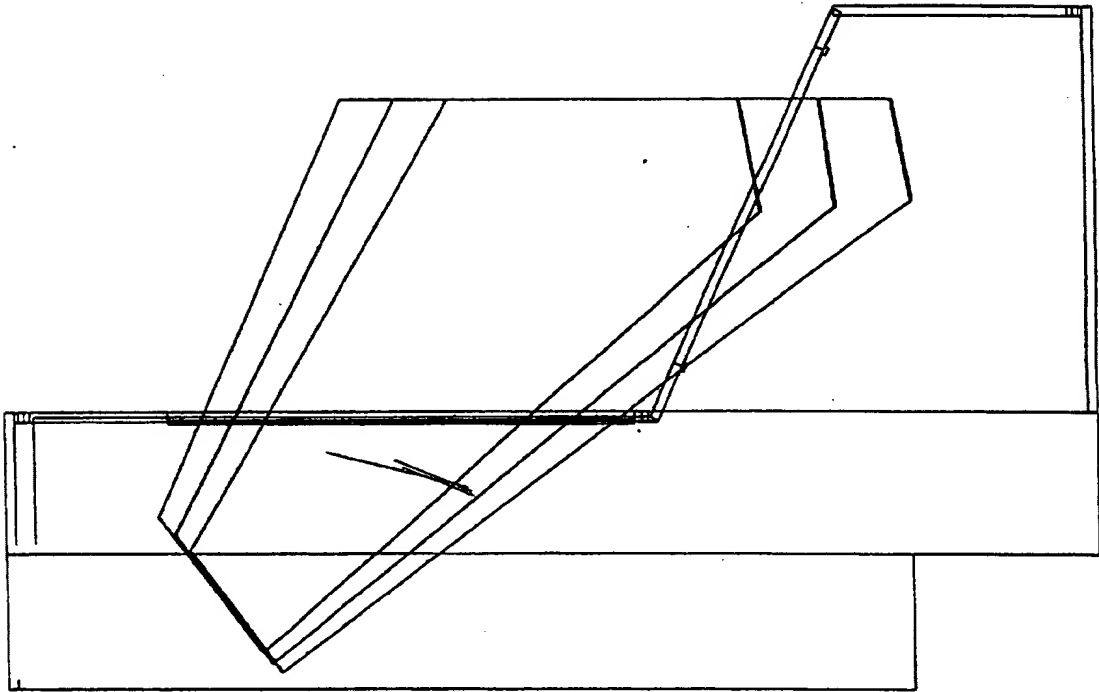
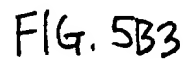


FIG. 5B2

1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379</
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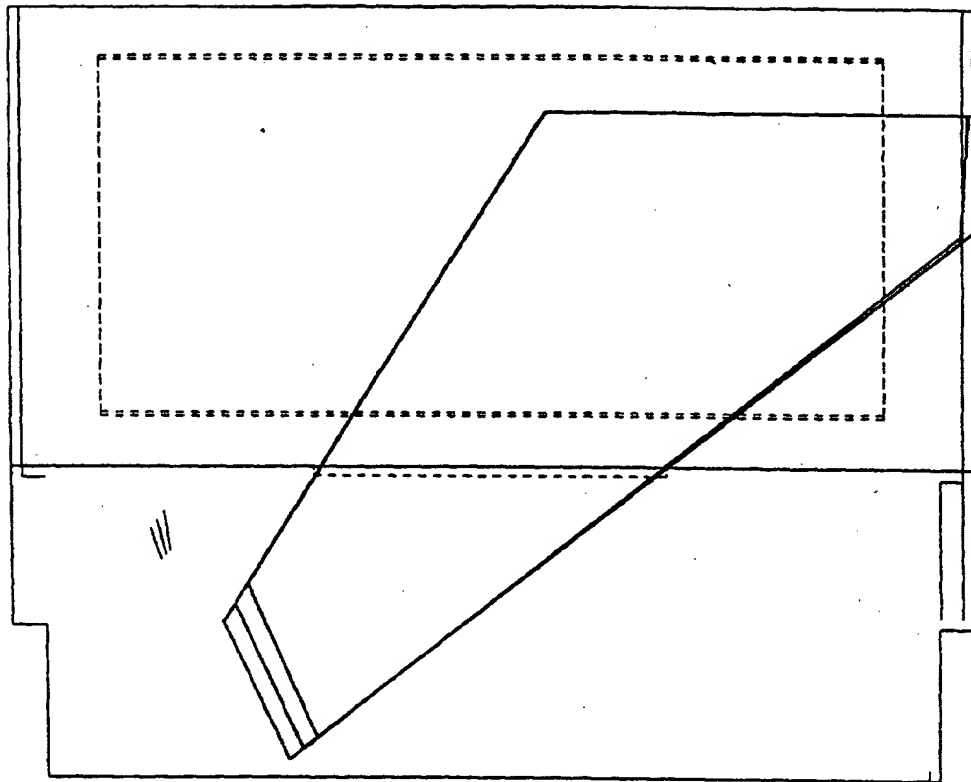


FIG. 5B4

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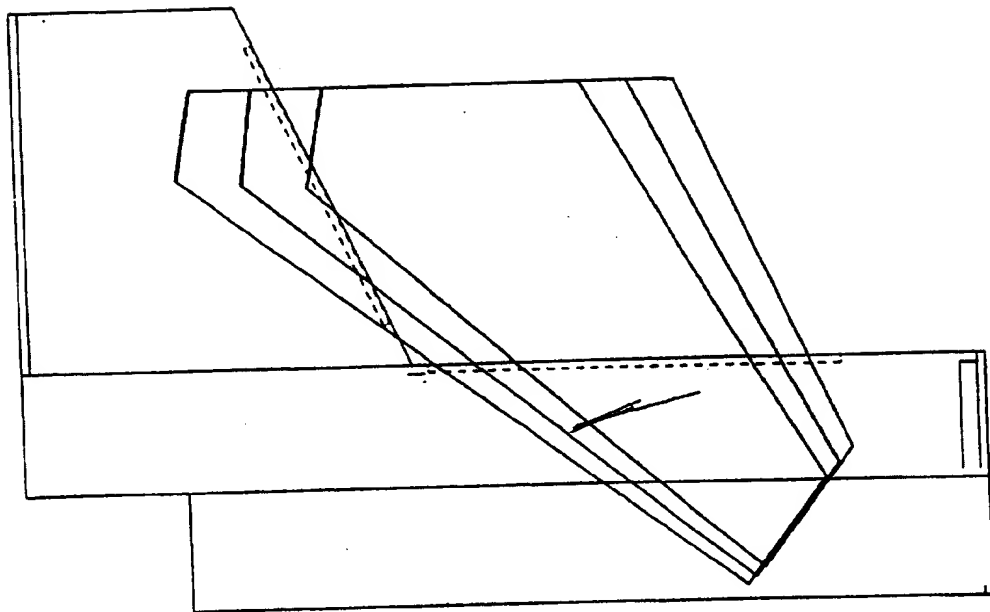
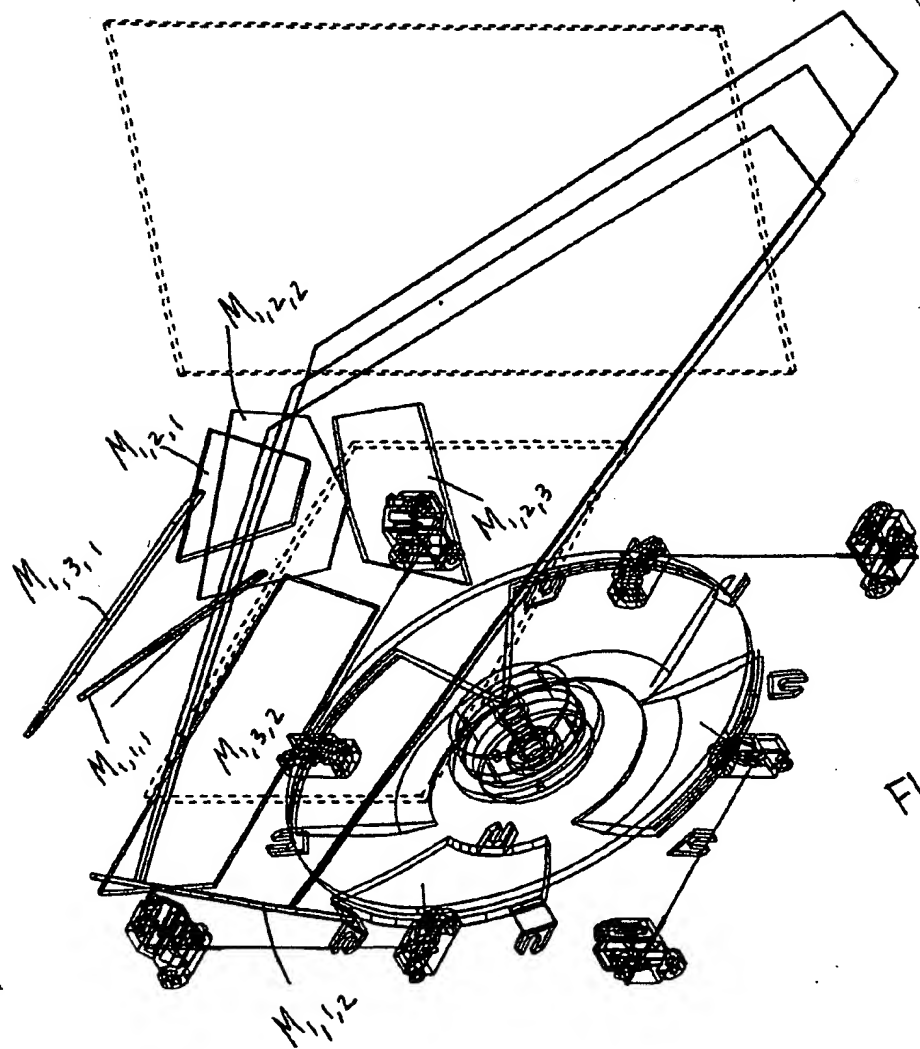


FIG. 5B5

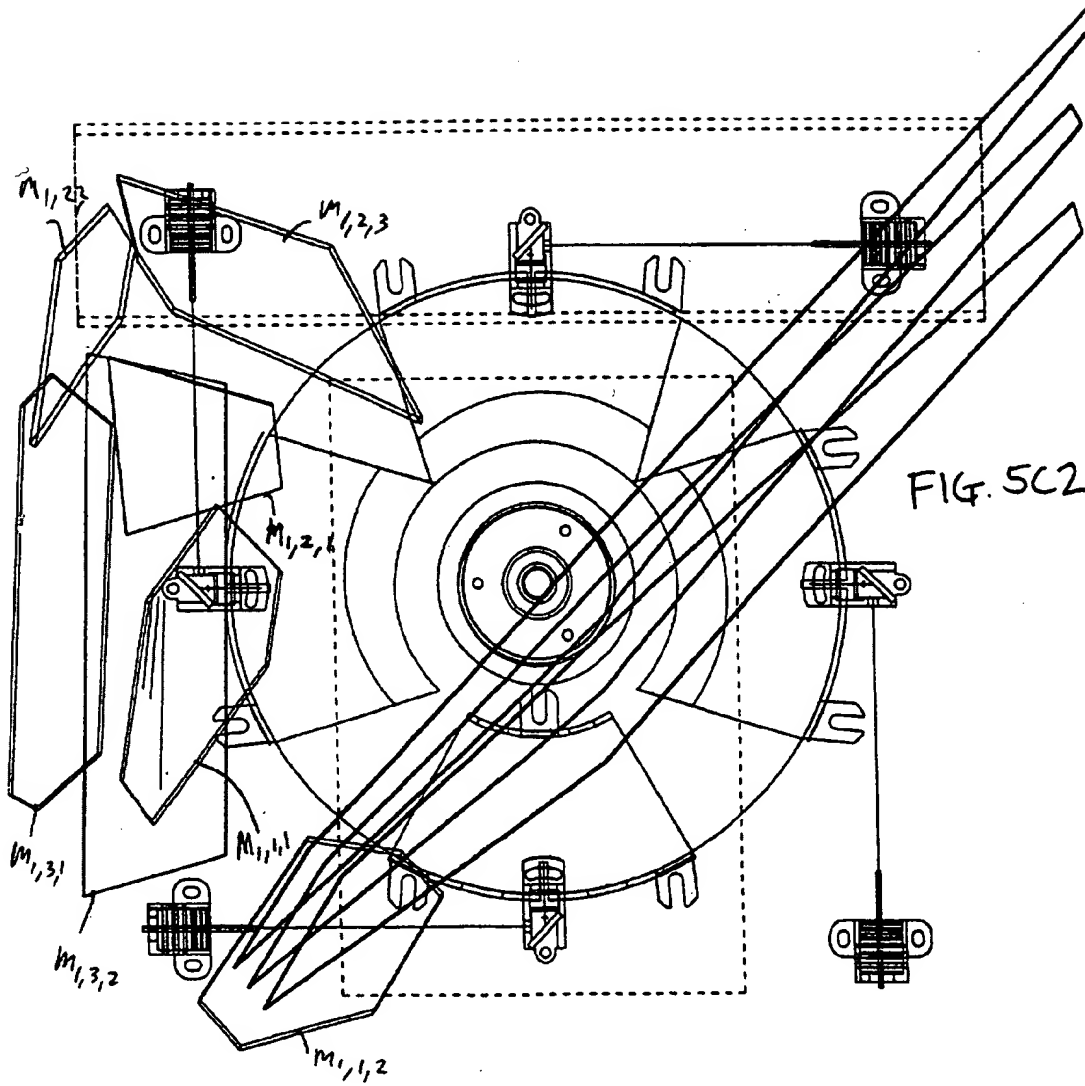
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FIG. 10 - 01037535 - 01037535



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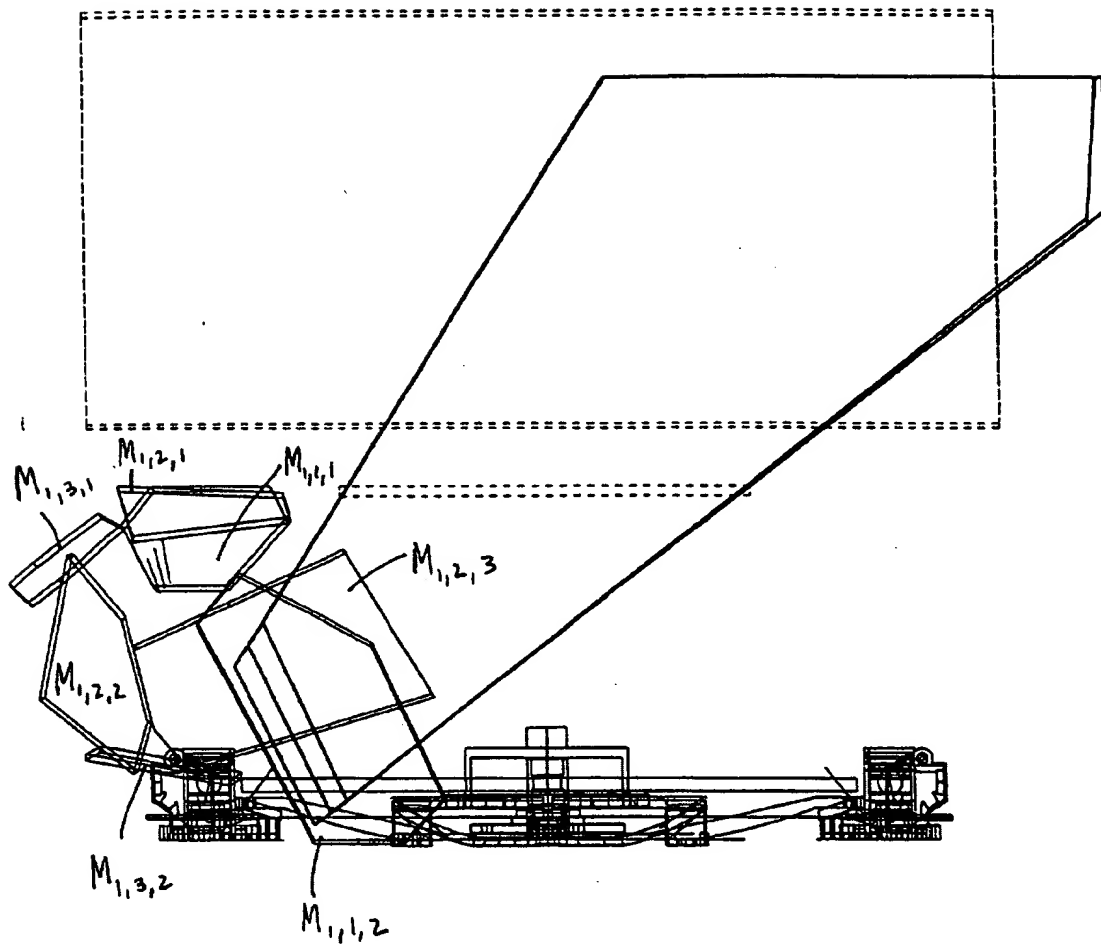


FIG. 5C3

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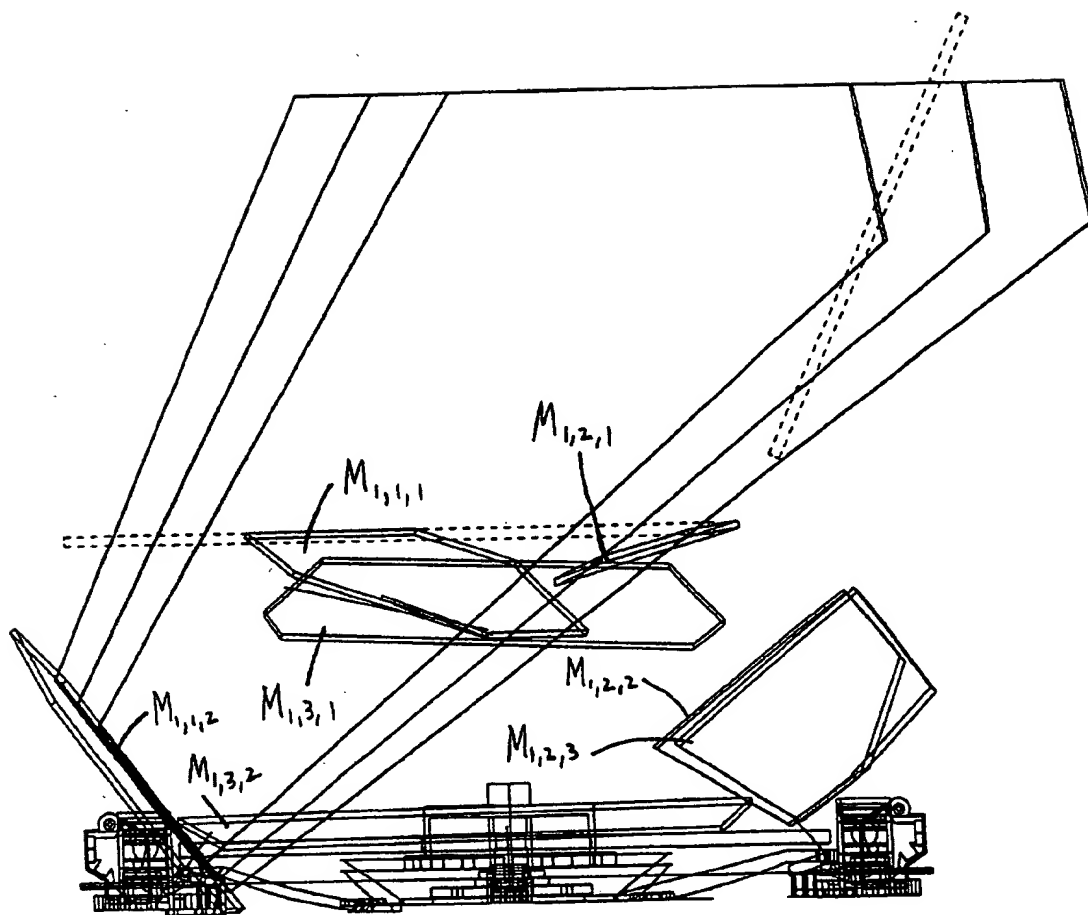


FIG. 5C4

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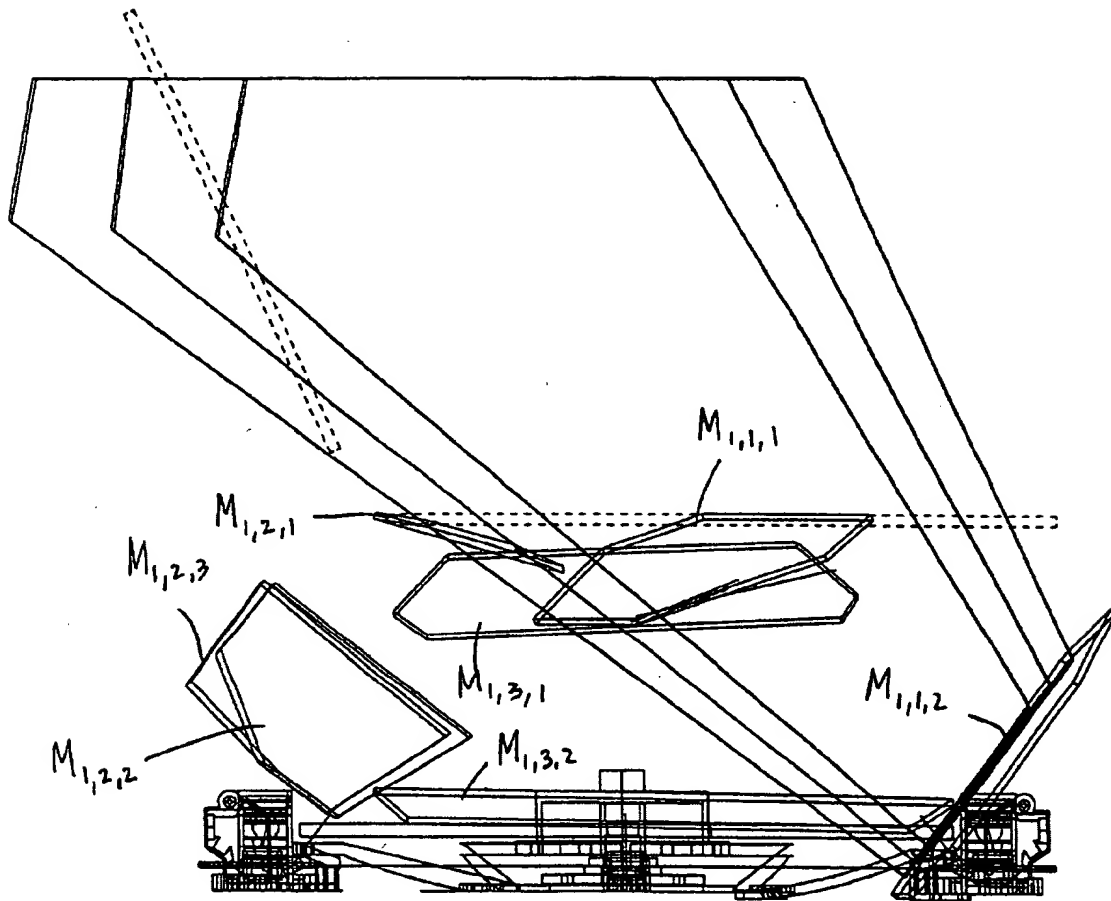


FIG. 5C5

Time	Temp	Humidity	Wind	Clouds	Pressure	Visibility	Remarks
0000	10.0	85	0.0	0	1013.2	10.0	Clear
0100	10.0	85	0.0	0	1013.2	10.0	Clear
0200	10.0	85	0.0	0	1013.2	10.0	Clear
0300	10.0	85	0.0	0	1013.2	10.0	Clear
0400	10.0	85	0.0	0	1013.2	10.0	Clear
0500	10.0	85	0.0	0	1013.2	10.0	Clear
0600	10.0	85	0.0	0	1013.2	10.0	Clear
0700	10.0	85	0.0	0	1013.2	10.0	Clear
0800	10.0	85	0.0	0	1013.2	10.0	Clear
0900	10.0	85	0.0	0	1013.2	10.0	Clear
1000	10.0	85	0.0	0	1013.2	10.0	Clear
1100	10.0	85	0.0	0	1013.2	10.0	Clear
1200	10.0	85	0.0	0	1013.2	10.0	Clear
1300	10.0	85	0.0	0	1013.2	10.0	Clear
1400	10.0	85	0.0	0	1013.2	10.0	Clear
1500	10.0	85	0.0	0	1013.2	10.0	Clear
1600	10.0	85	0.0	0	1013.2	10.0	Clear
1700	10.0	85	0.0	0	1013.2	10.0	Clear
1800	10.0	85	0.0	0	1013.2	10.0	Clear
1900	10.0	85	0.0	0	1013.2	10.0	Clear
2000	10.0	85	0.0	0	1013.2	10.0	Clear
2100	10.0	85	0.0	0	1013.2	10.0	Clear
2200	10.0	85	0.0	0	1013.2	10.0	Clear
2300	10.0	85	0.0	0	1013.2	10.0	Clear

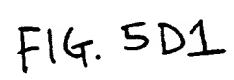


FIG. 5D1

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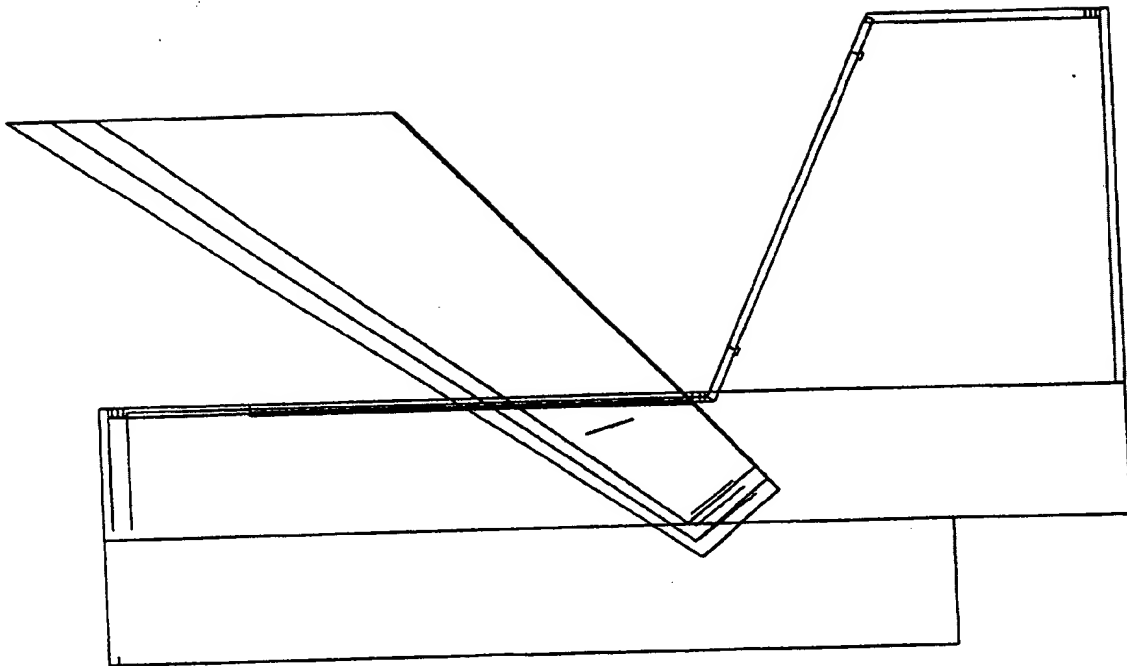


FIG. 5D2

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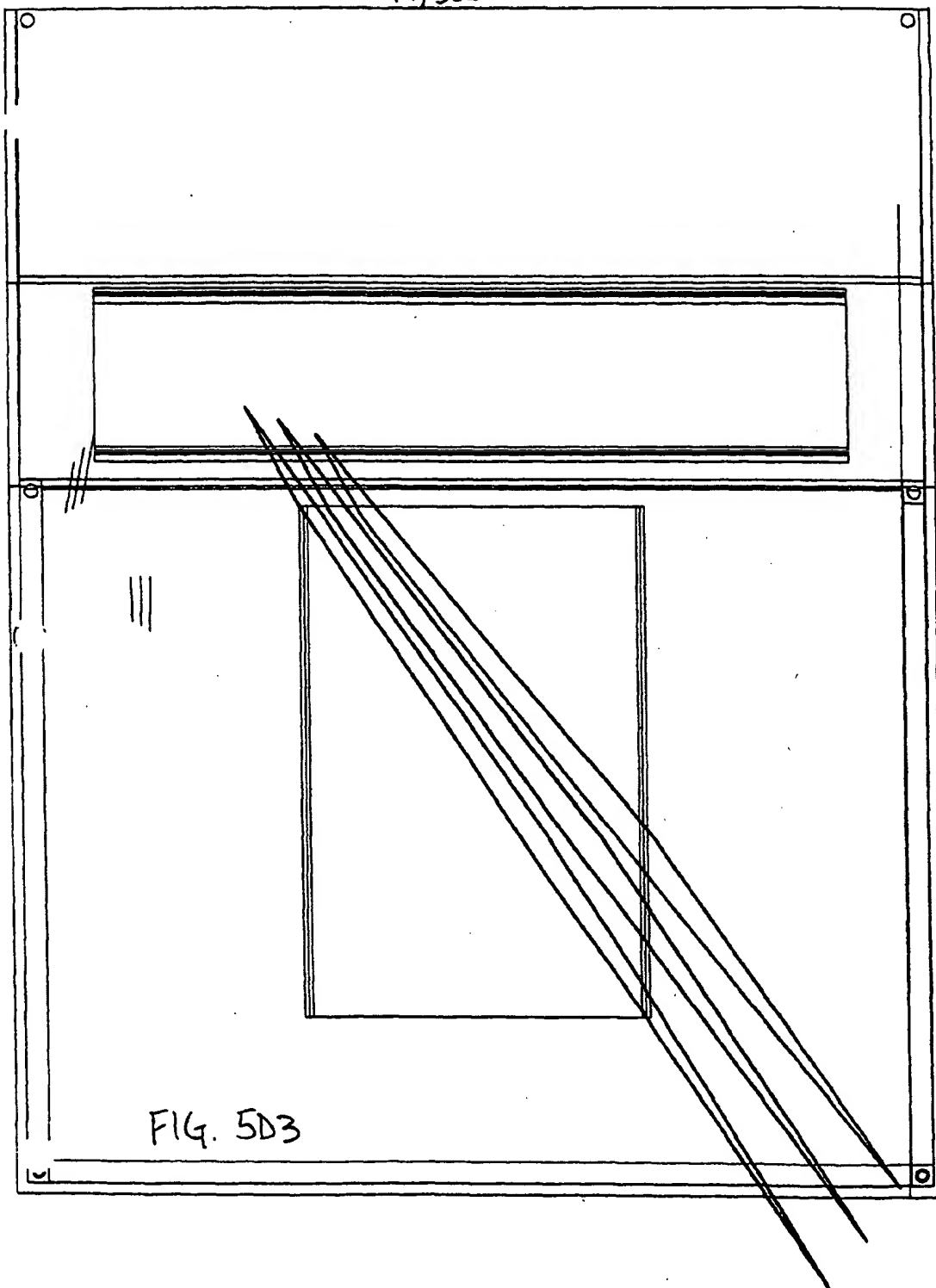


FIG. 5D3

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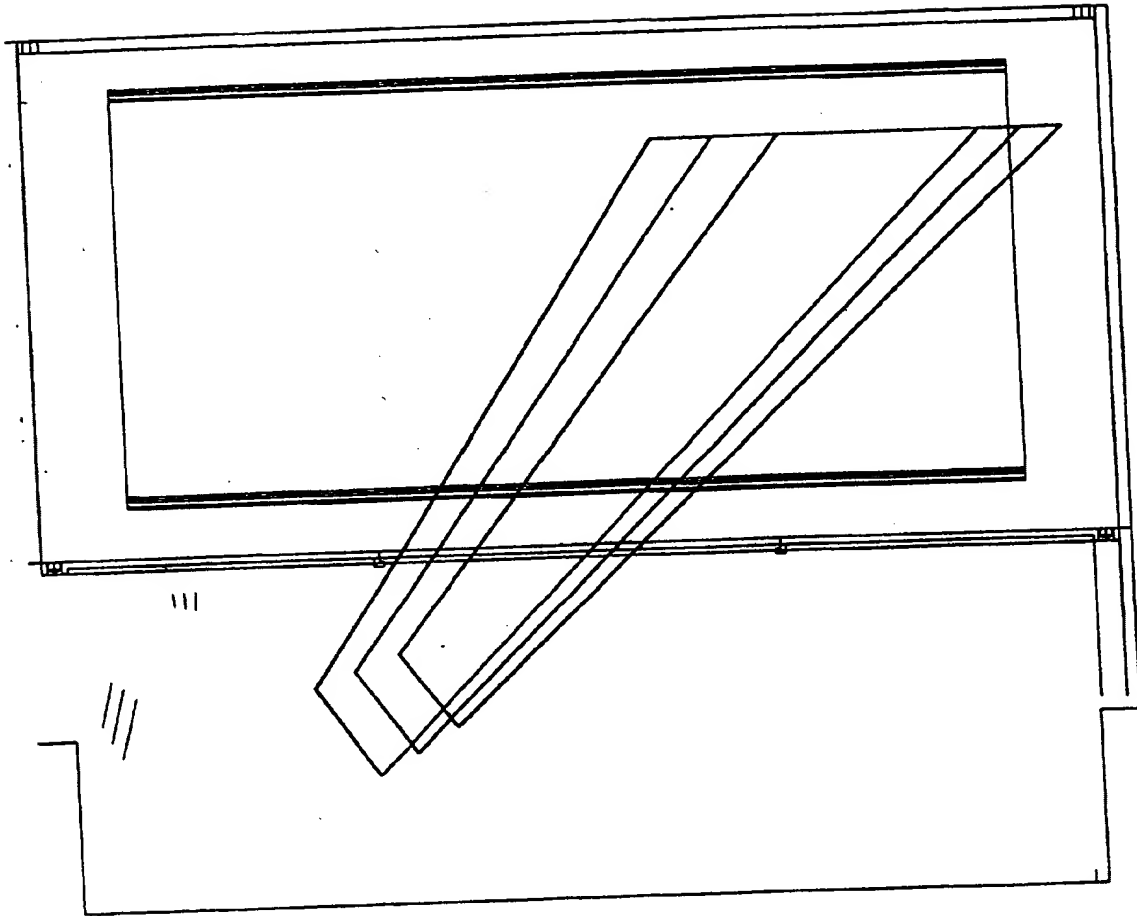


FIG. 5D4

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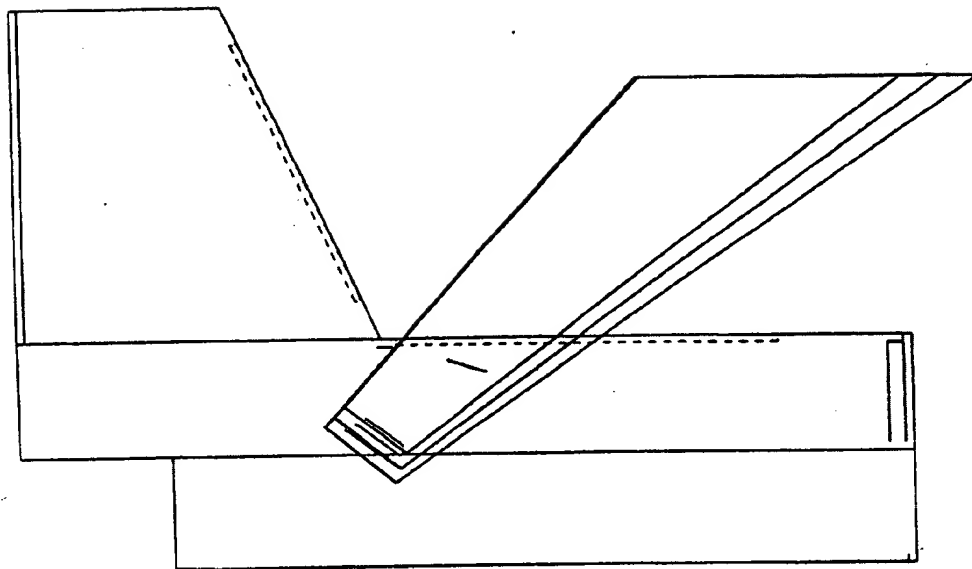
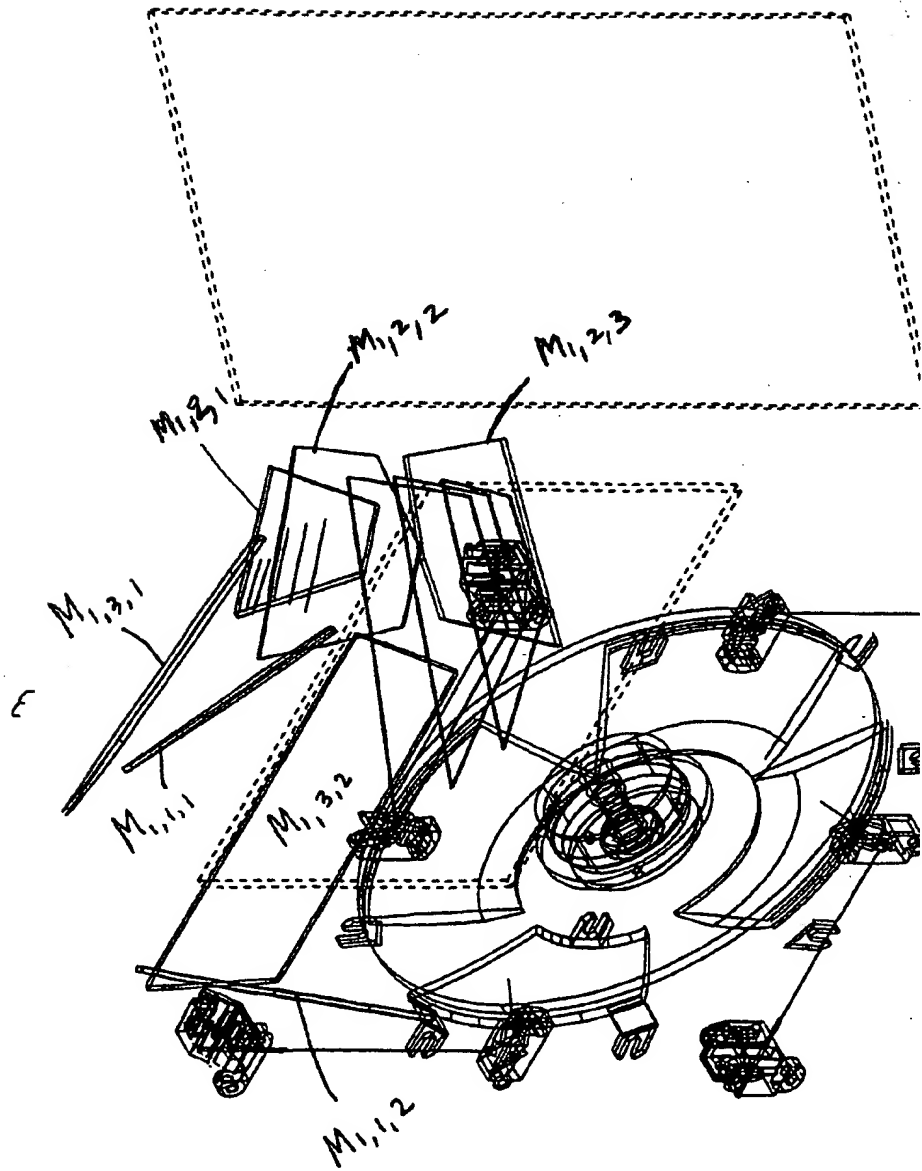


FIG. 5D5

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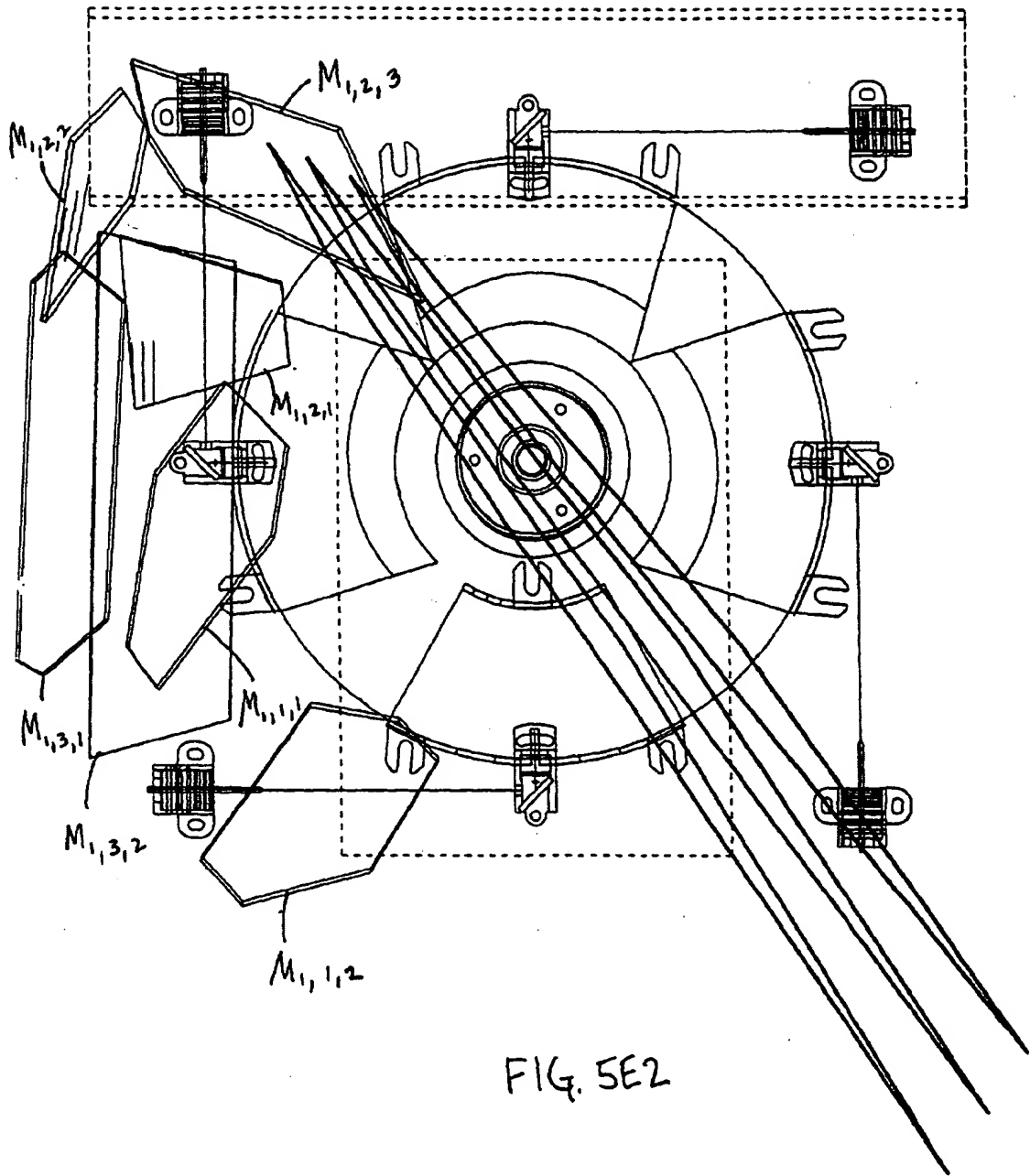


FIG. 5E2

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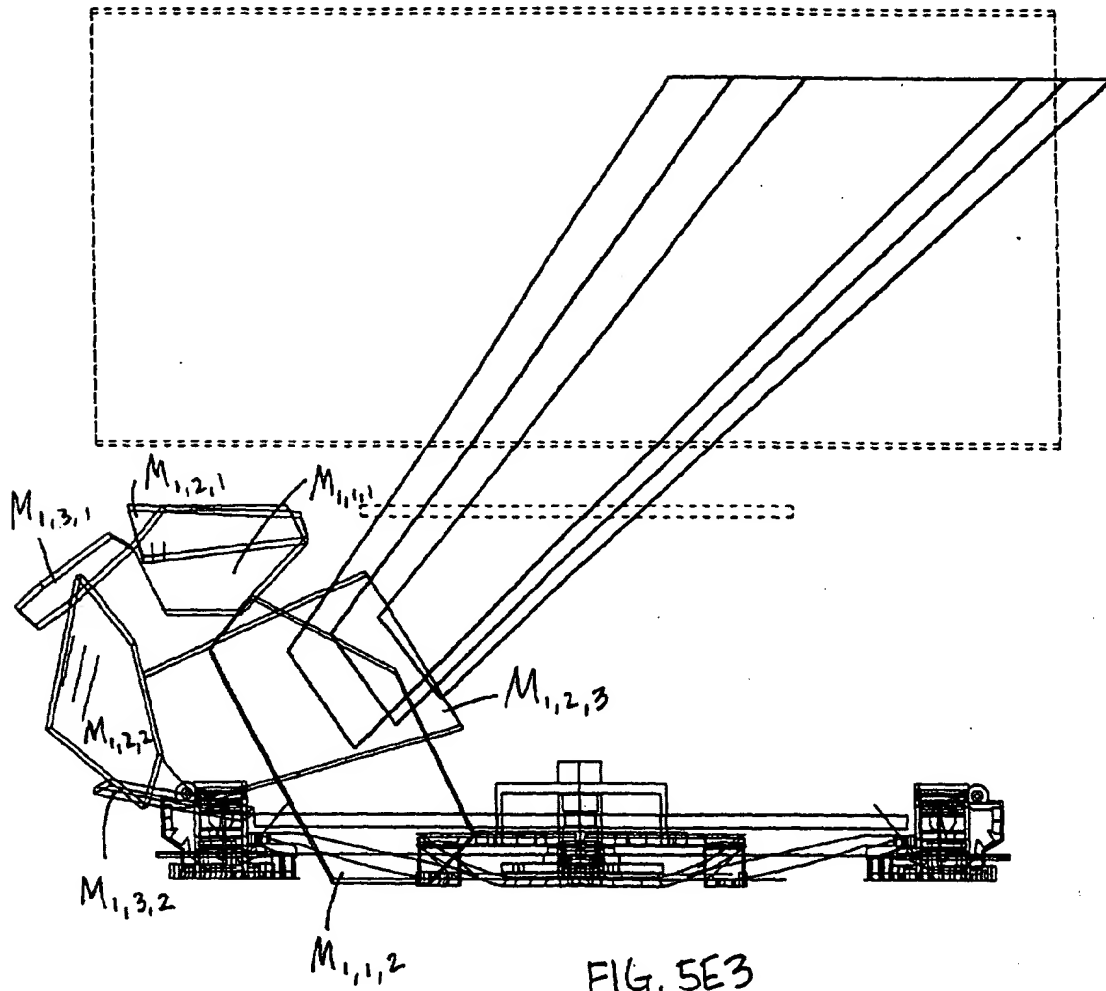


FIG. 5E3

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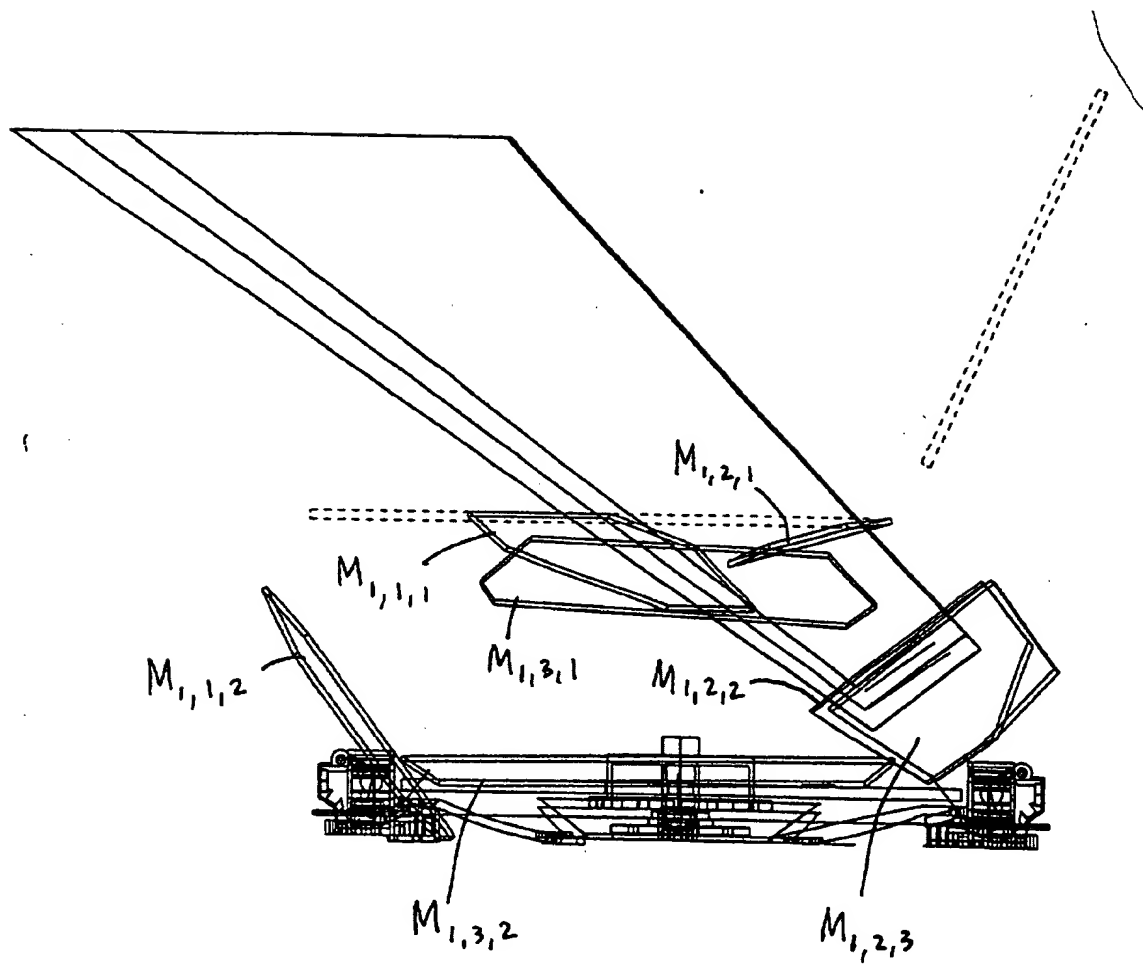


FIG. 5E4

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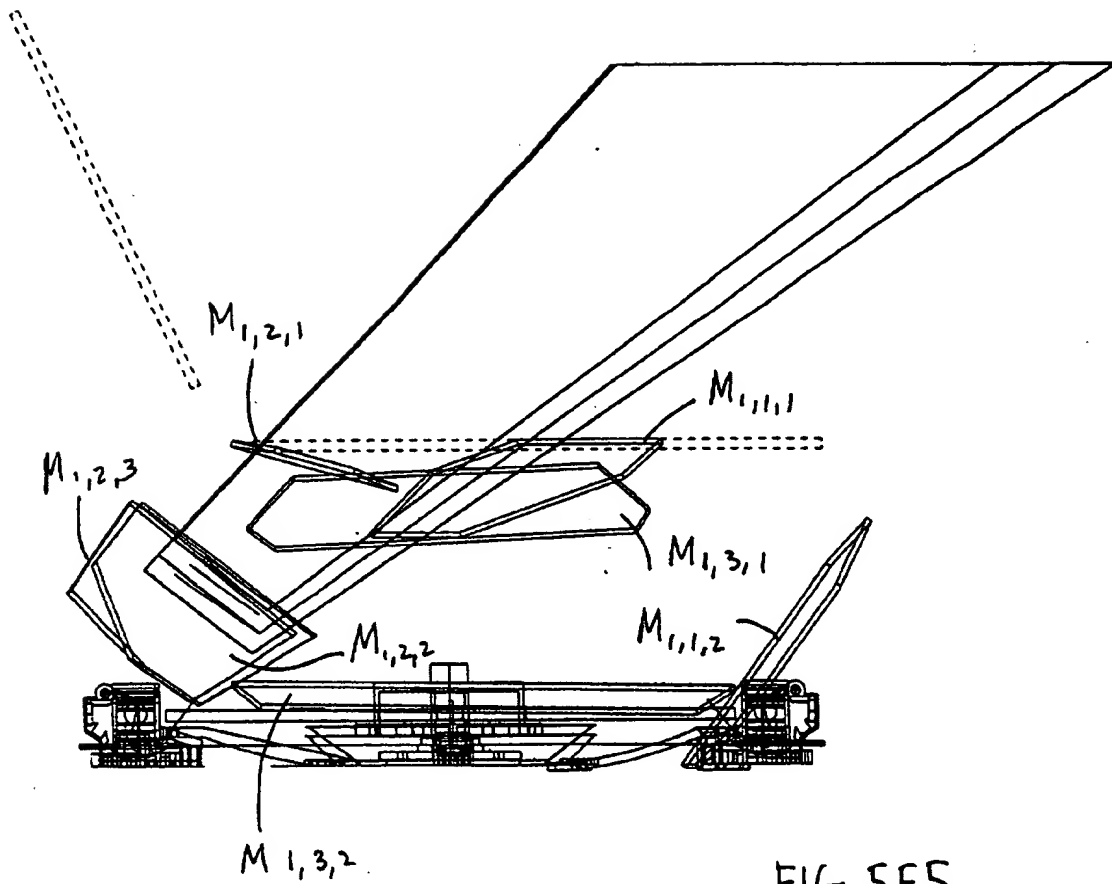


FIG. 5E5

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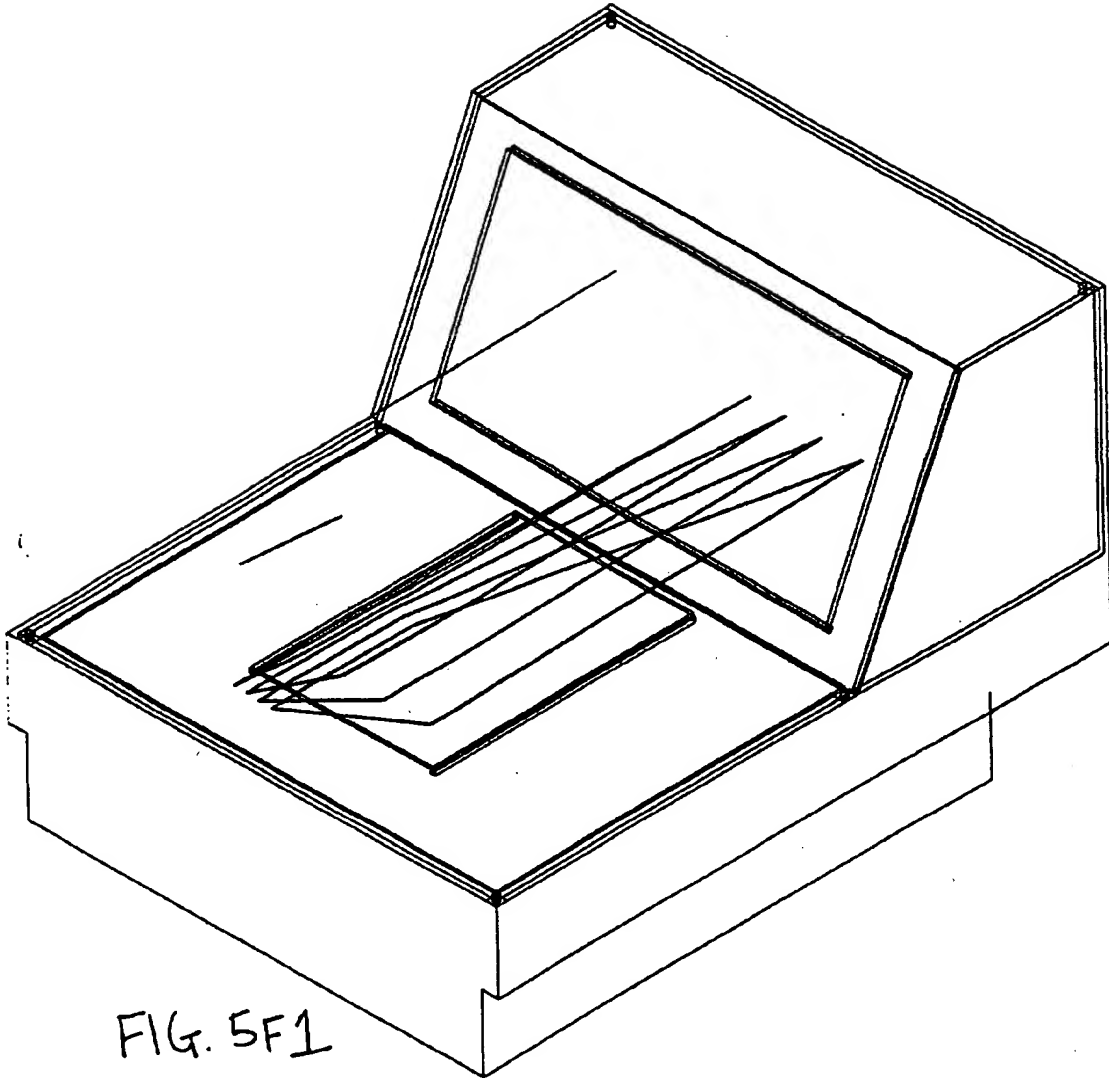


FIG. 5F1

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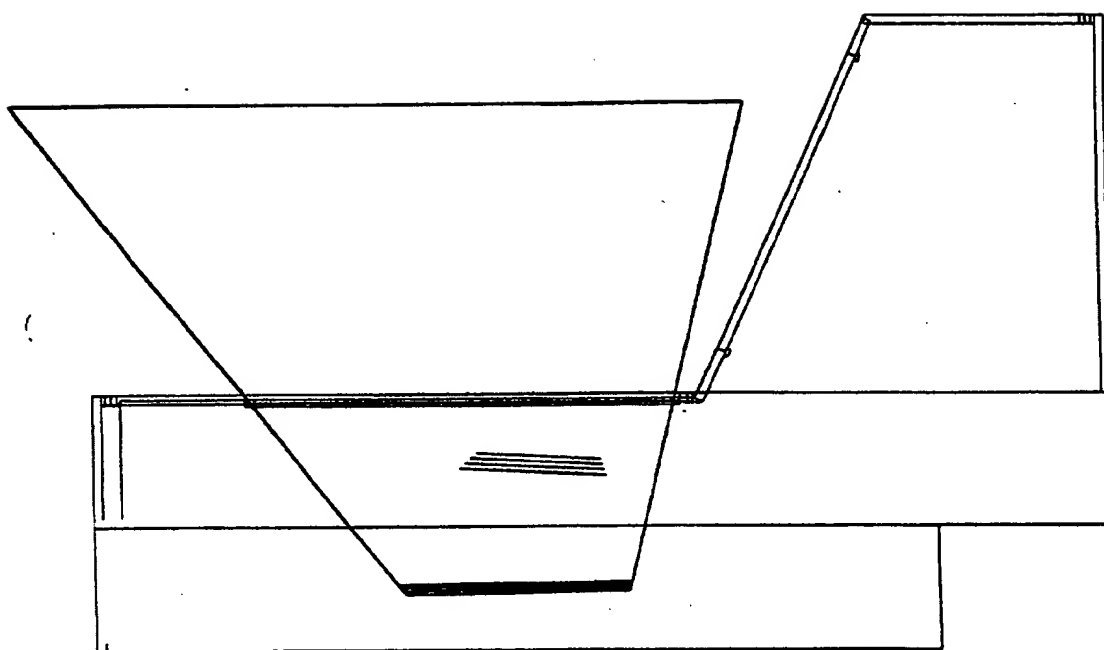


FIG. 5F2

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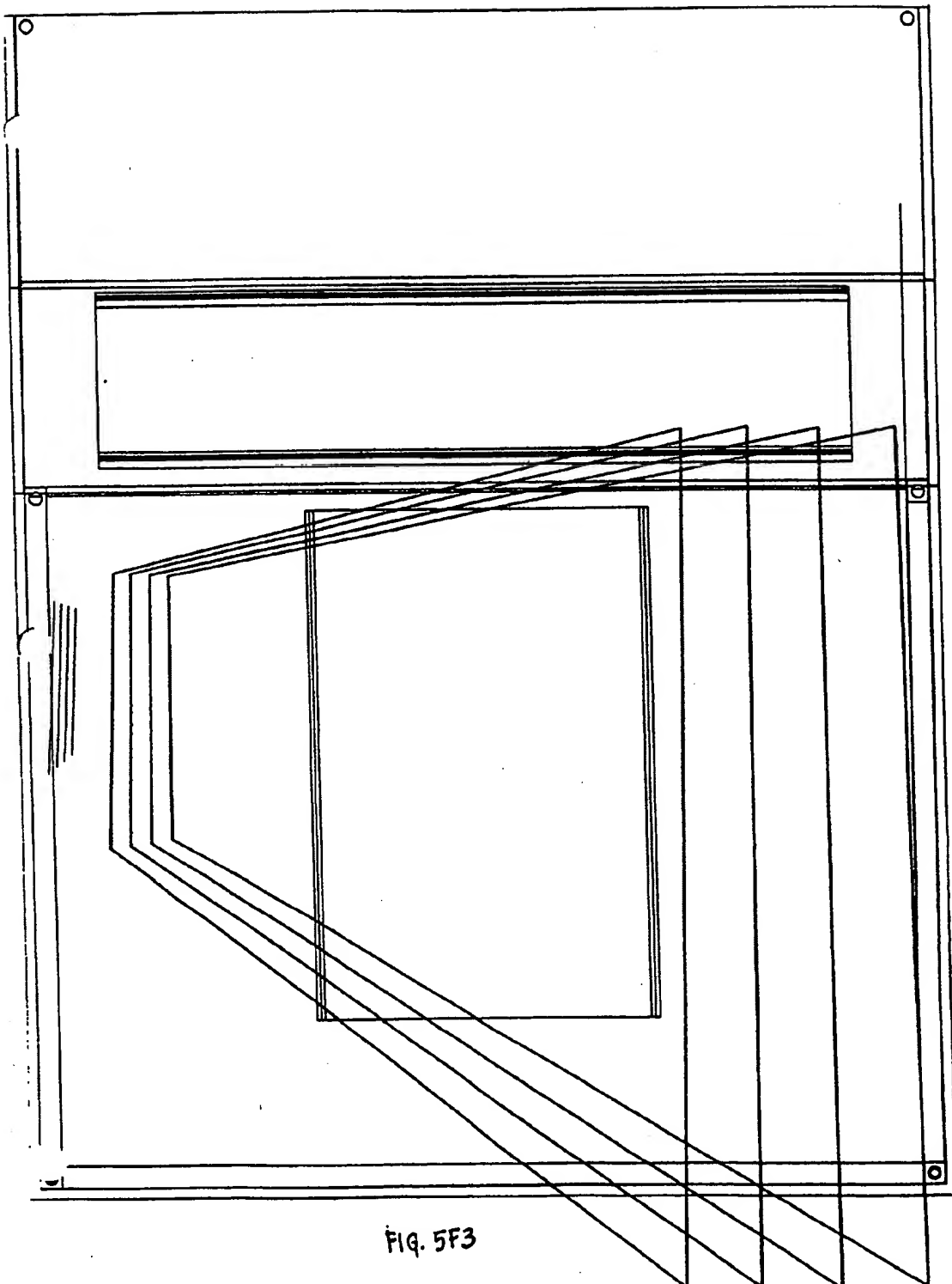


FIG. 5F3

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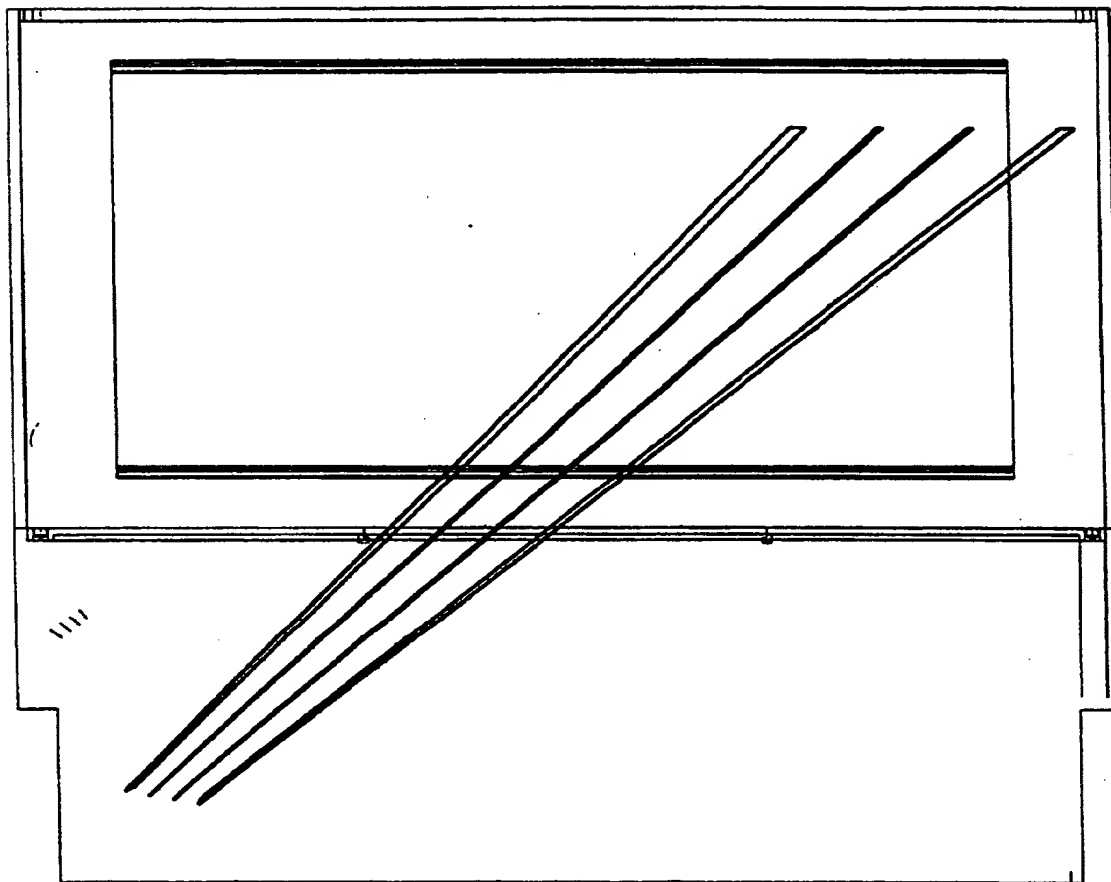


FIG. 5F4

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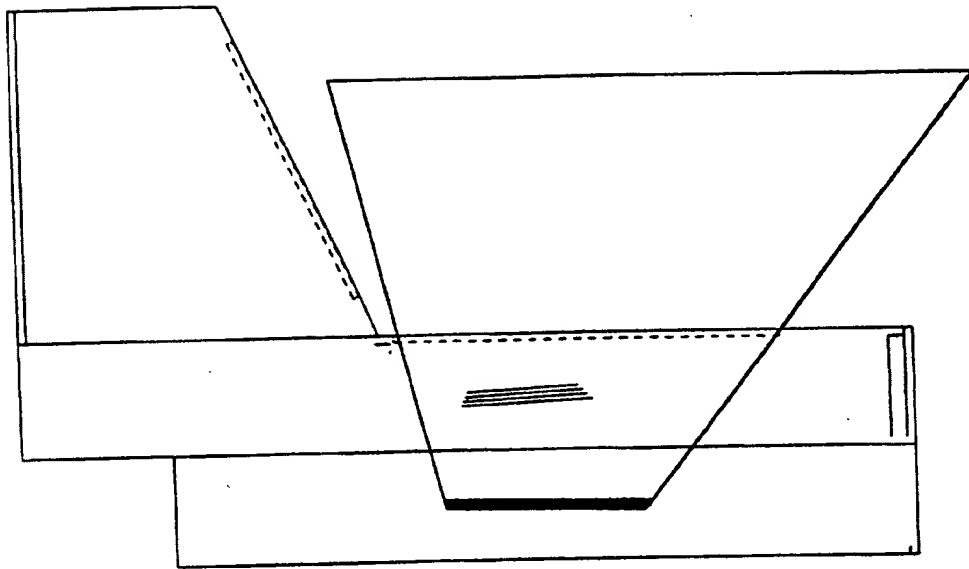
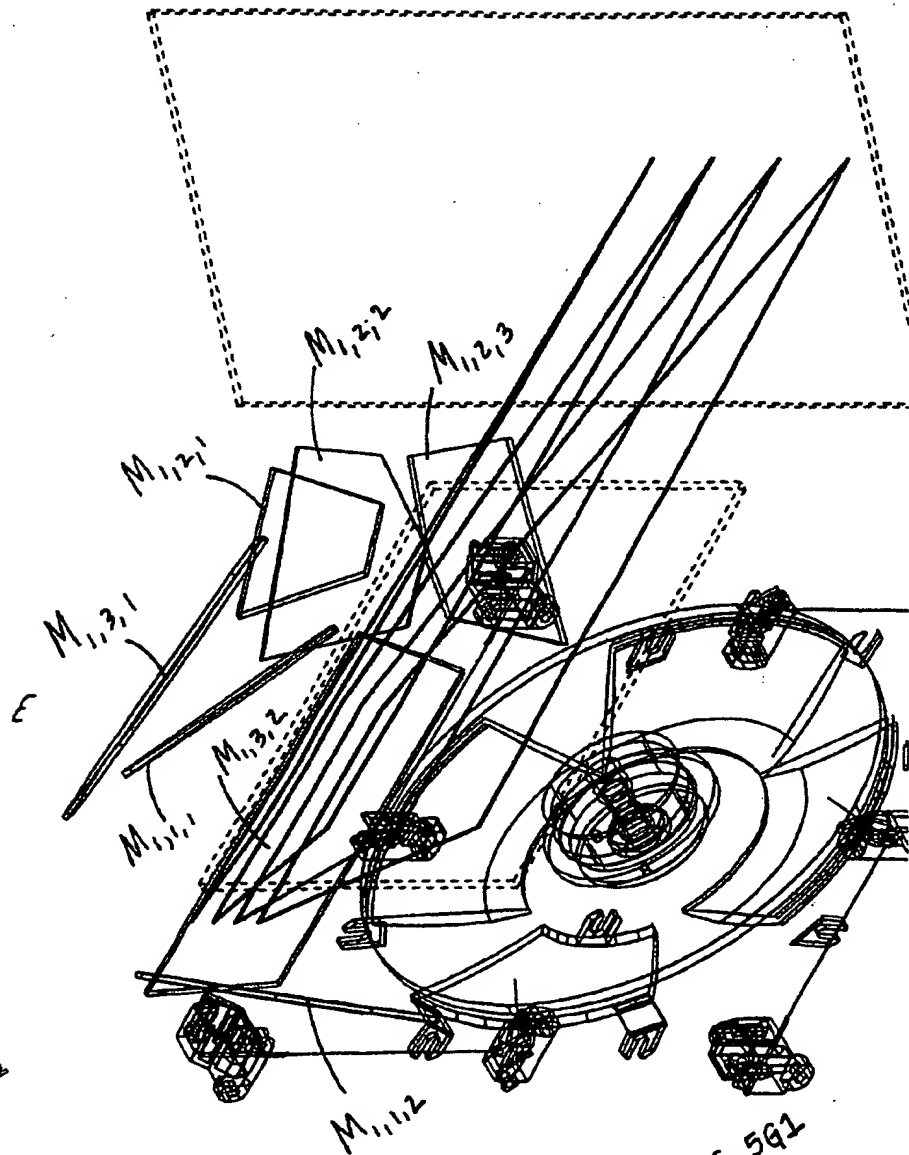


FIG. 5F5

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SECRET

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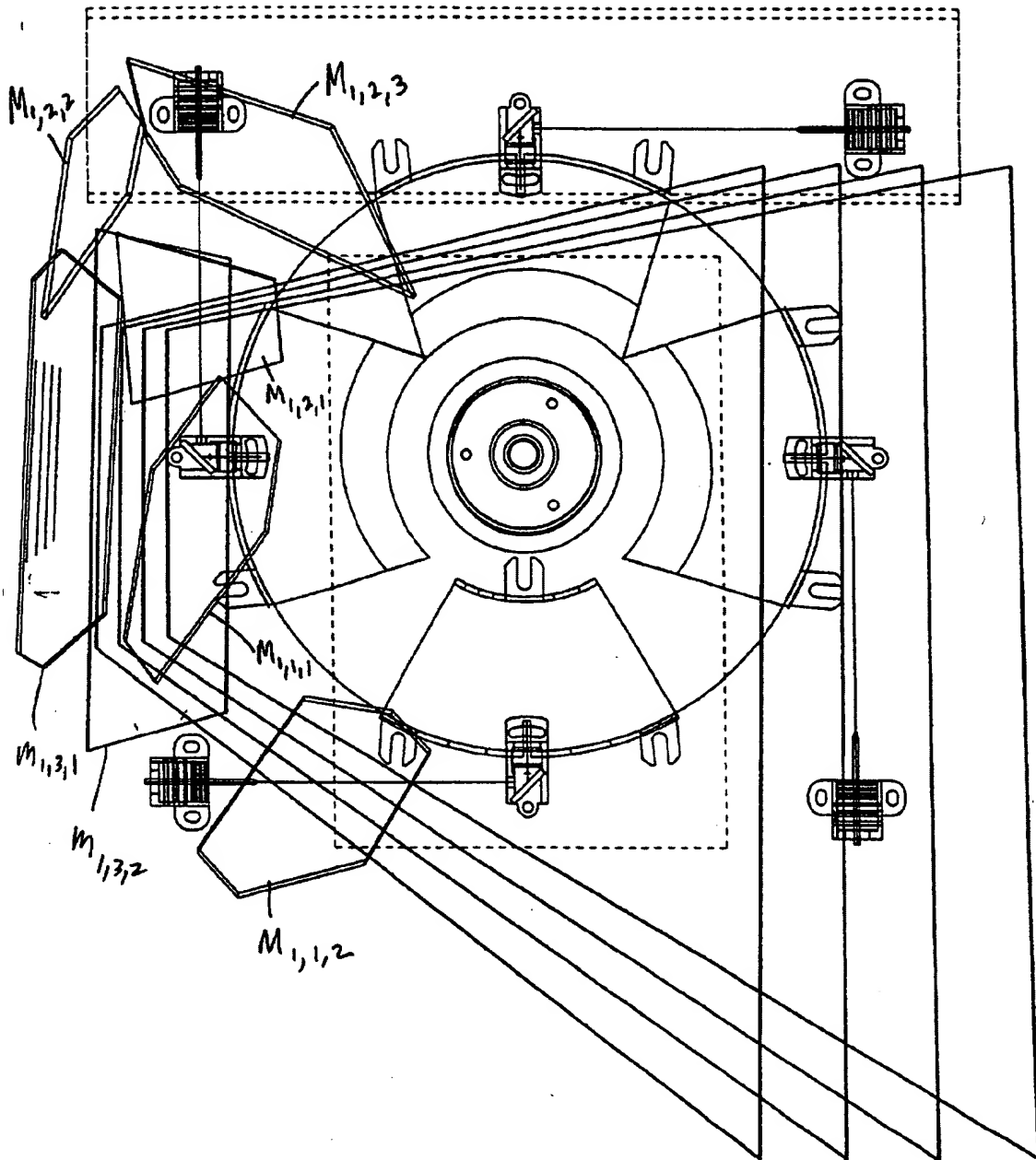


FIG. 5G2

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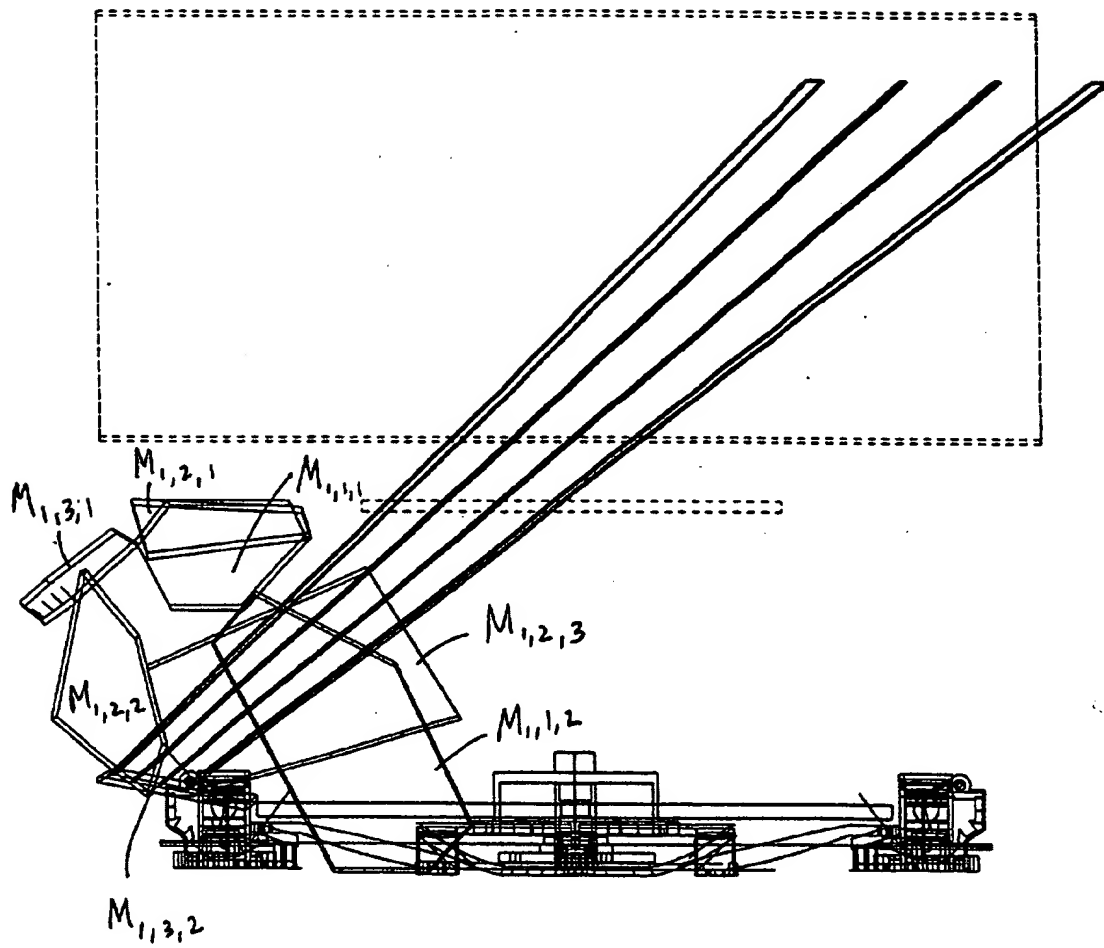


FIG 593

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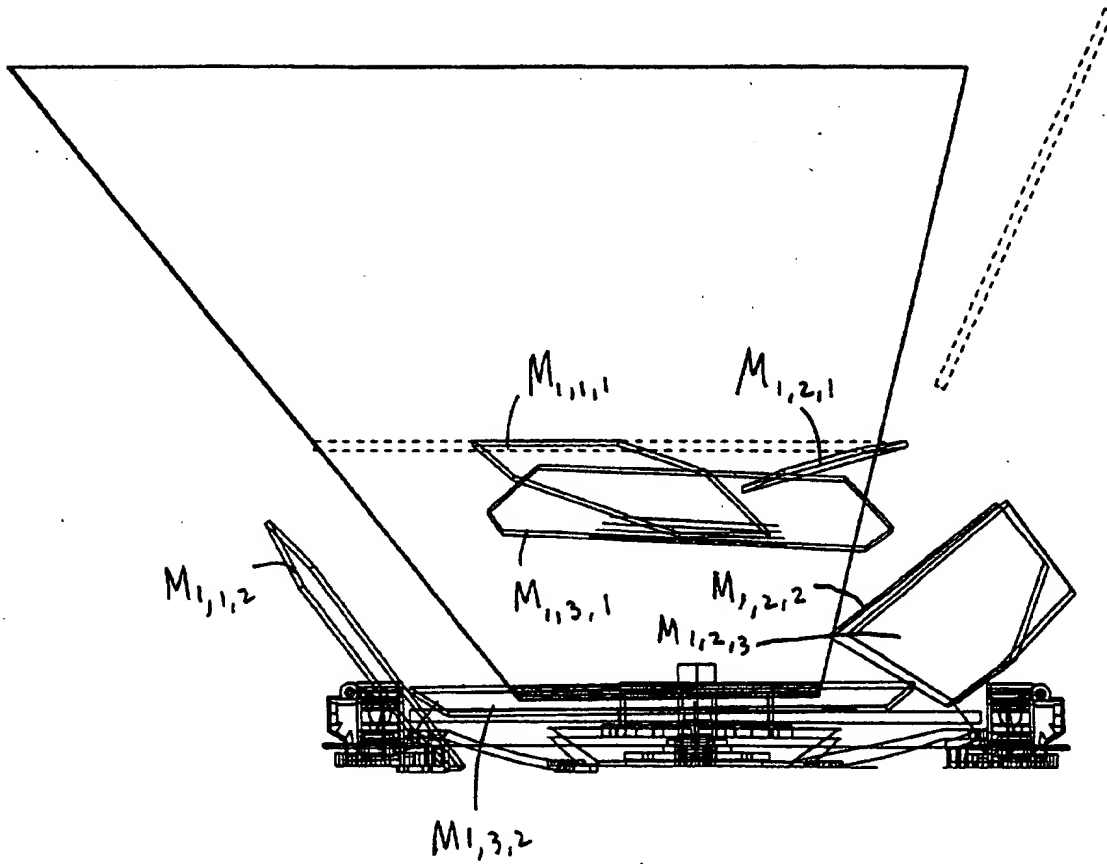


FIG. 594

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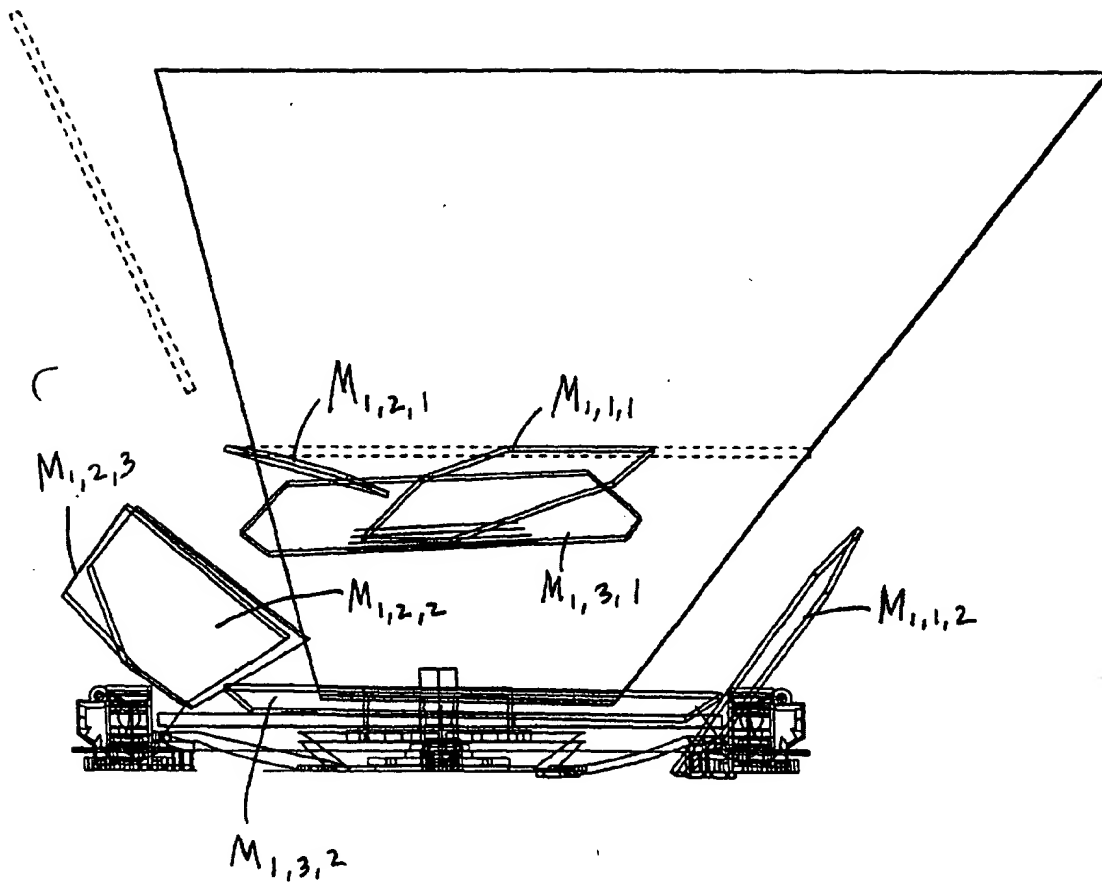
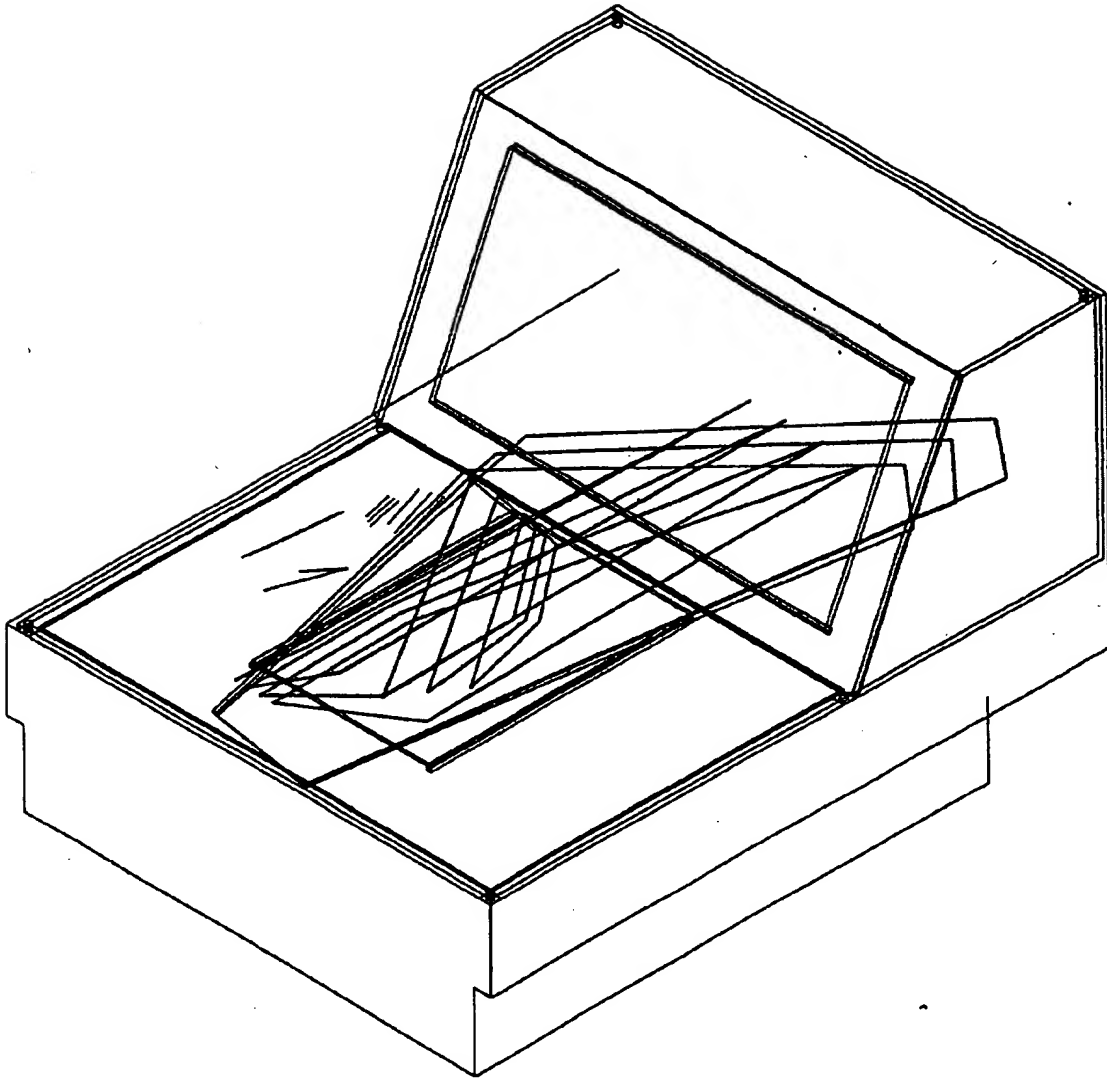


FIG. 565

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5H1

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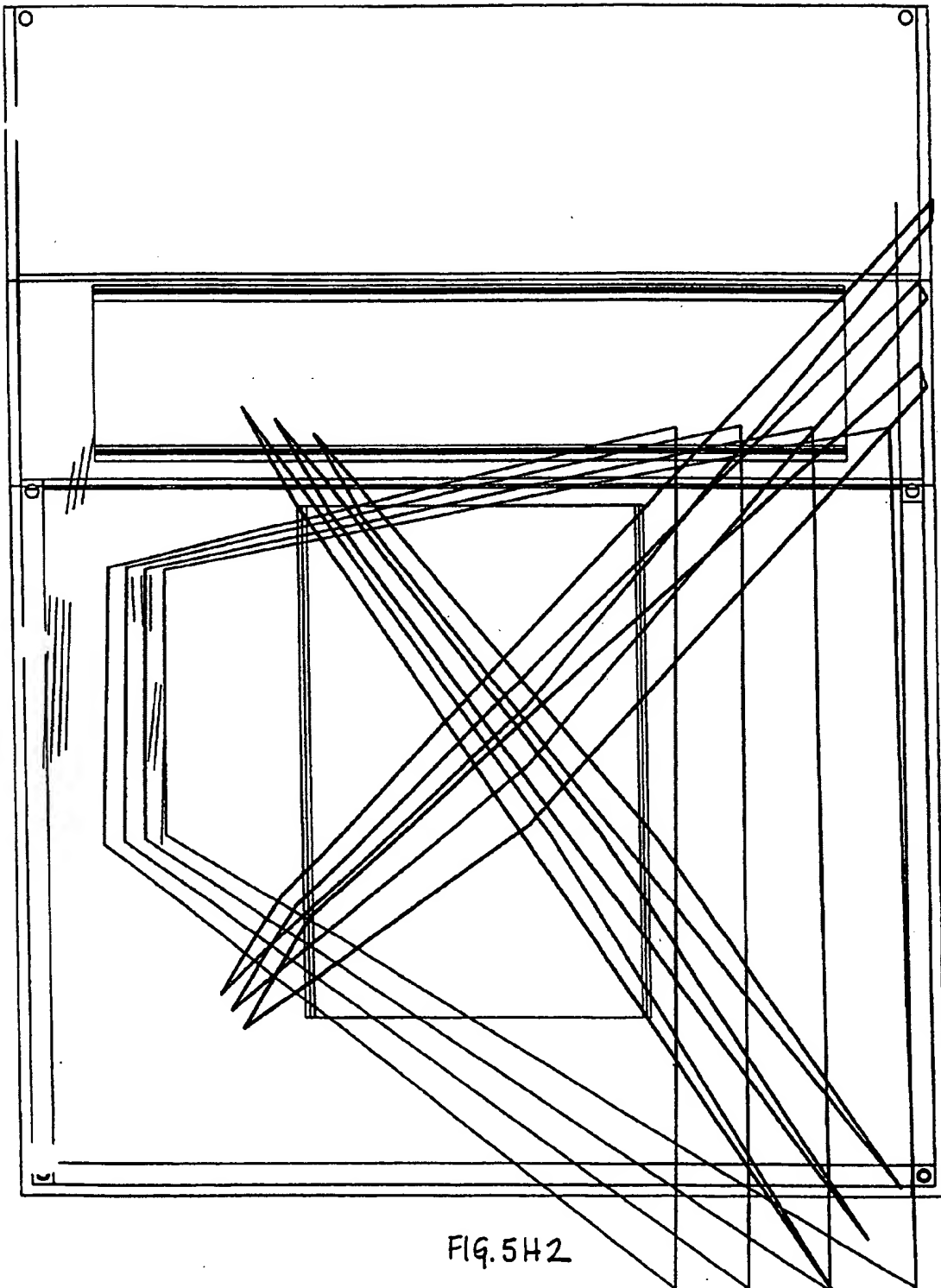


FIG. 5H2

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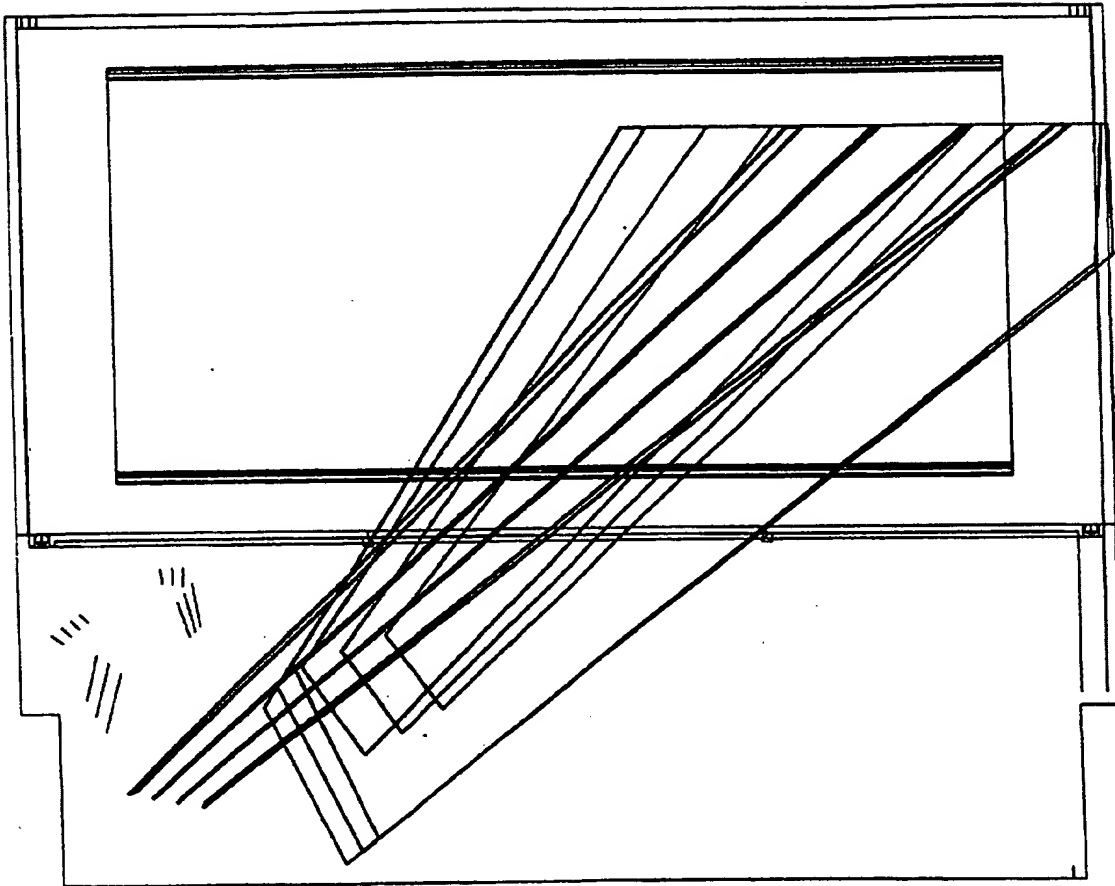


FIG. 5H3

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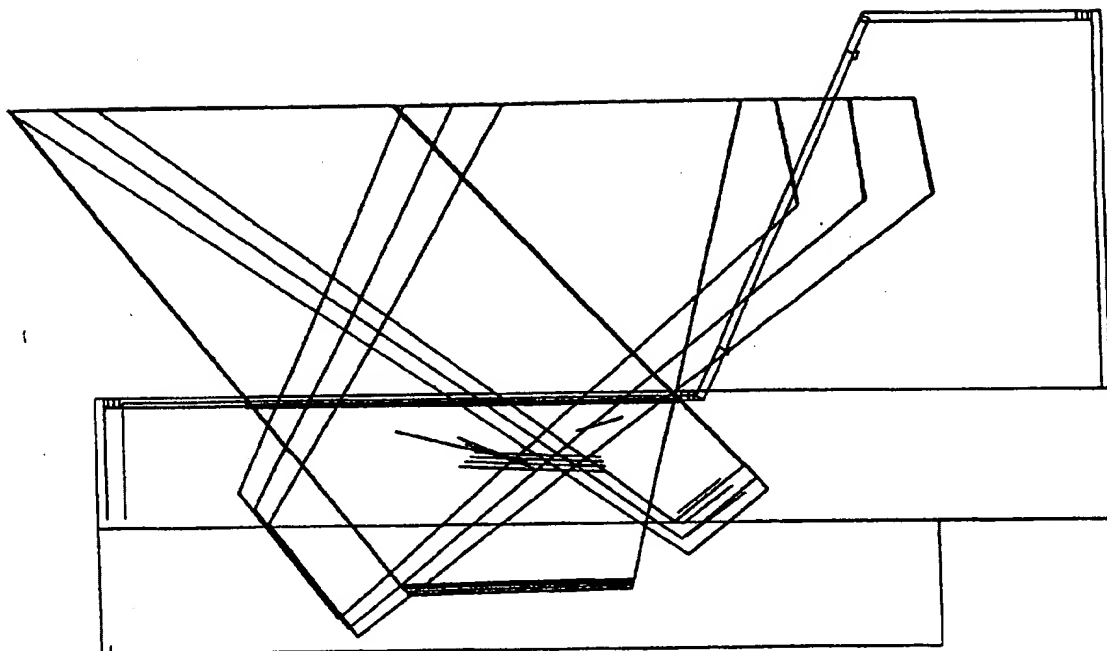


FIG. 5H4

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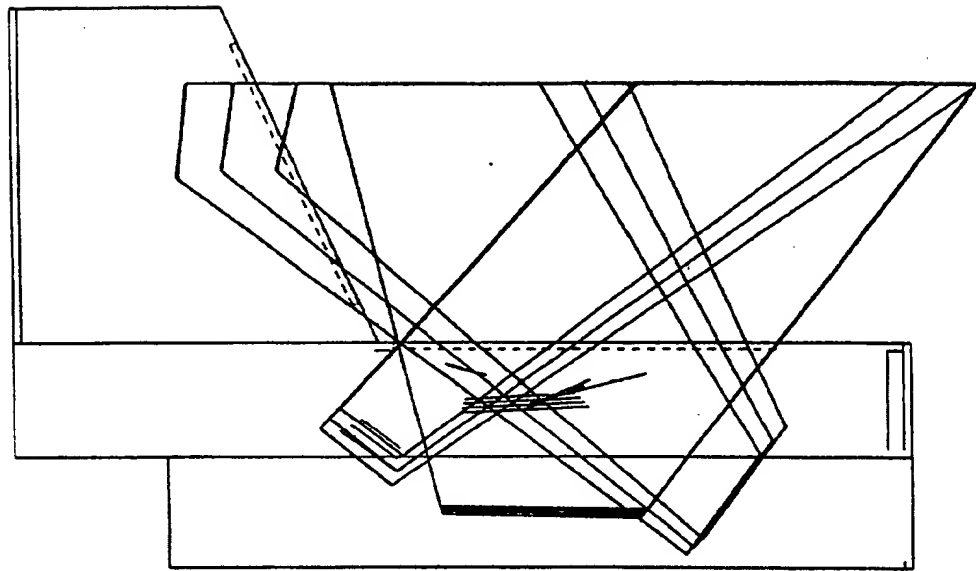


FIG. 545

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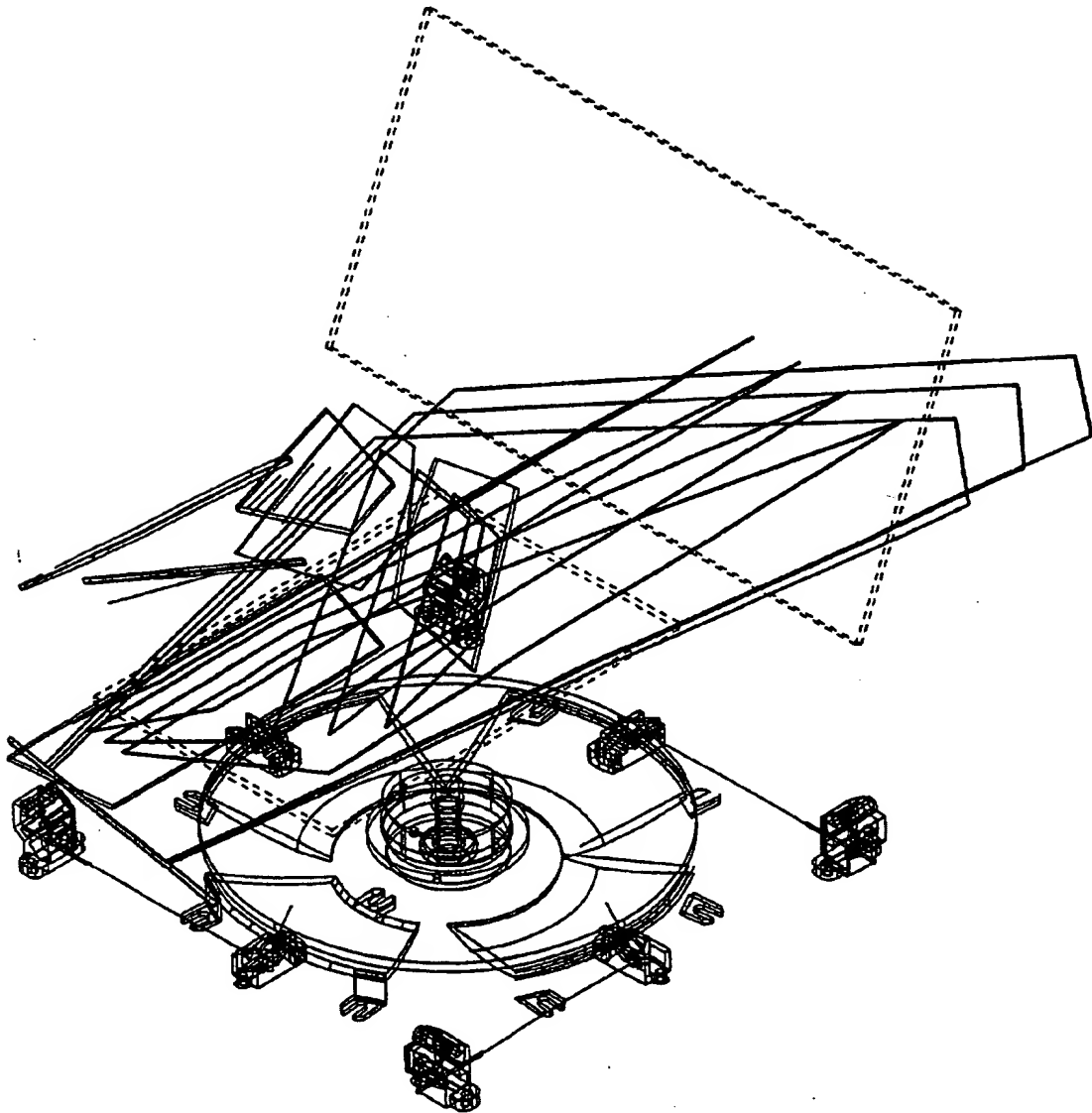


FIG. 5H6

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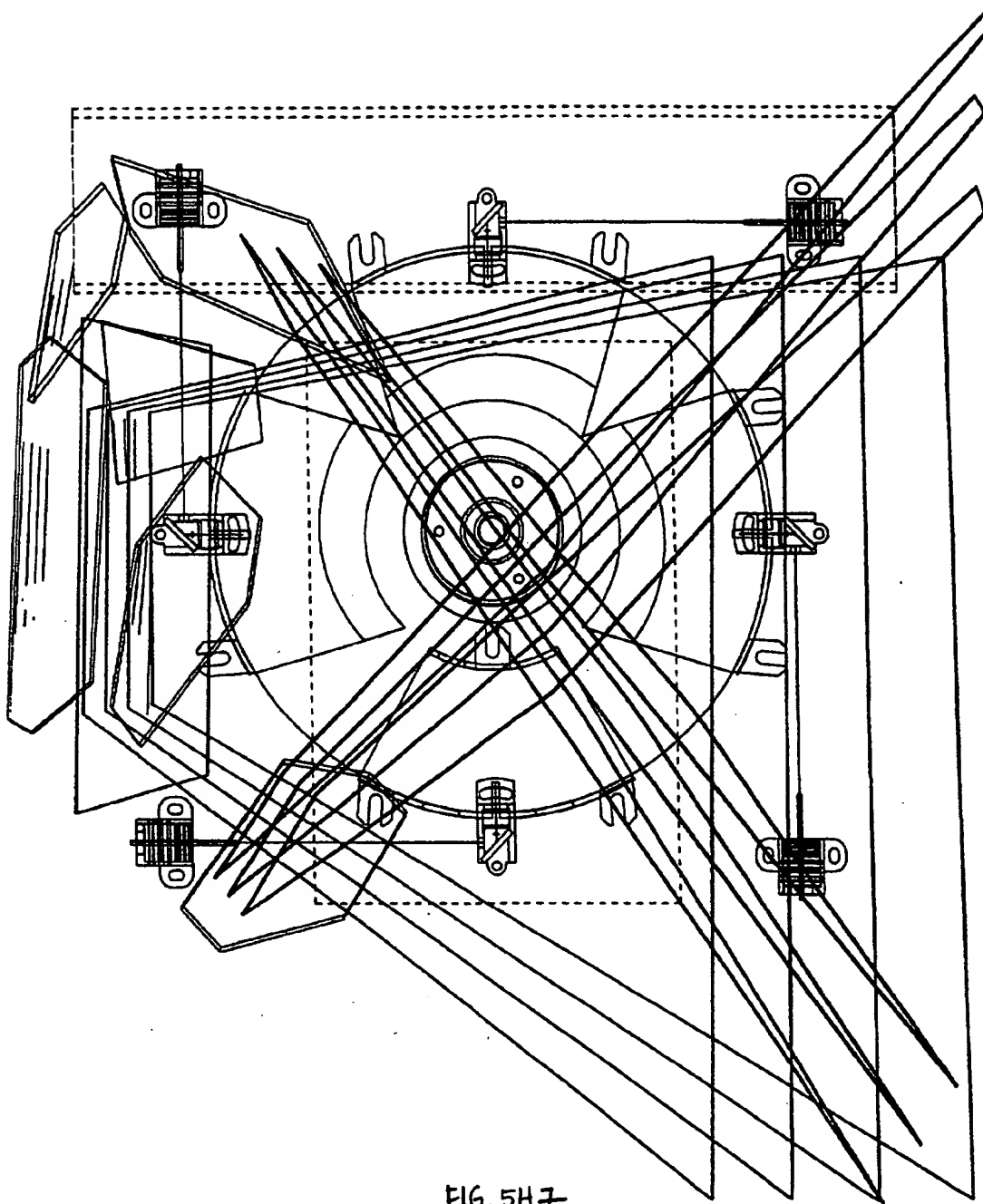


FIG. 5H7

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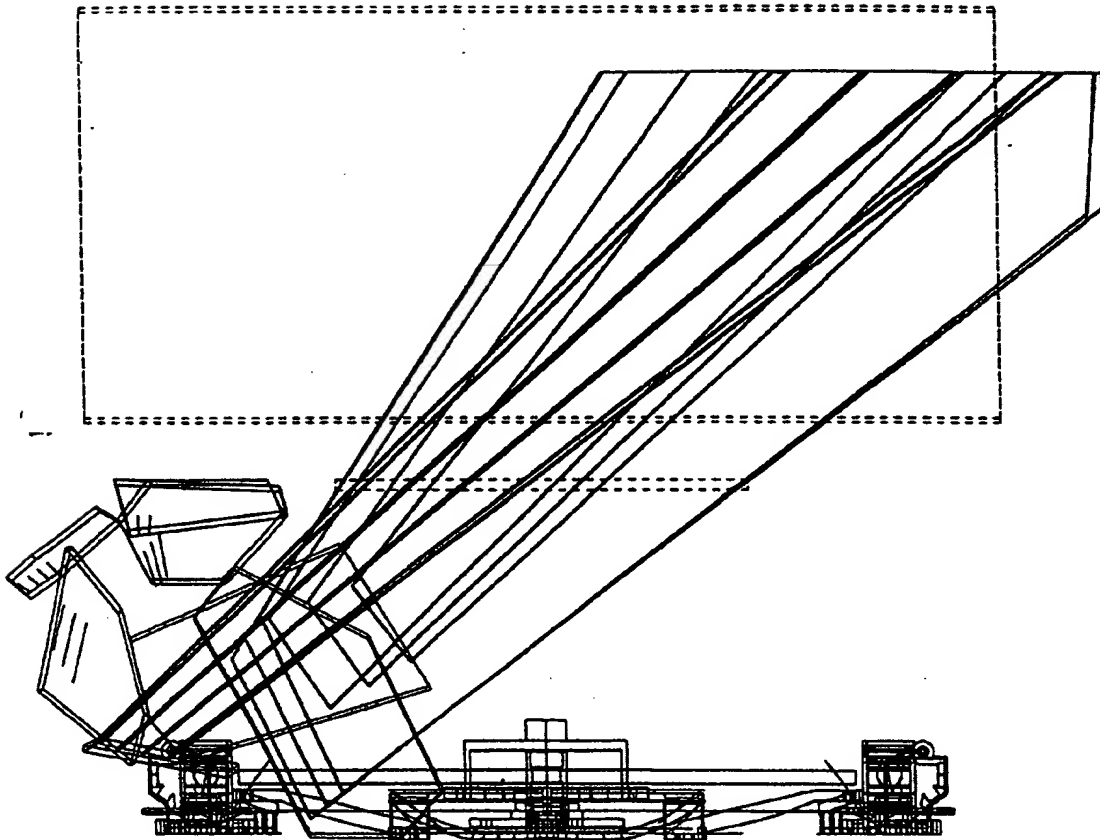


FIG. 5HB

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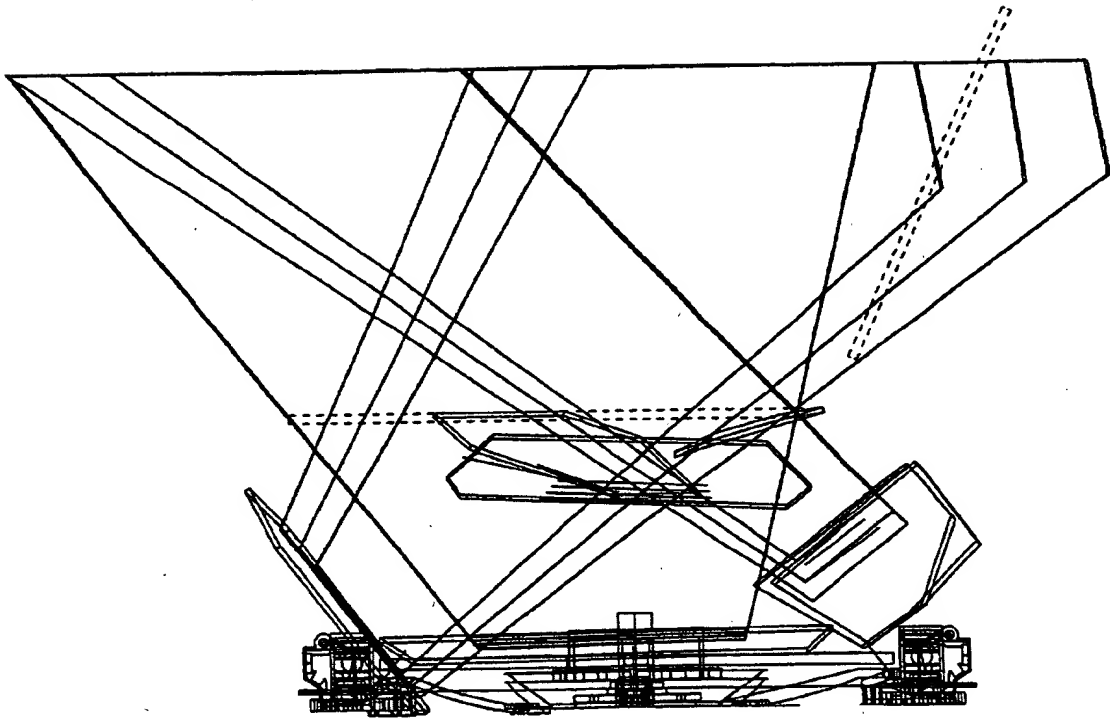


FIG. 5H9

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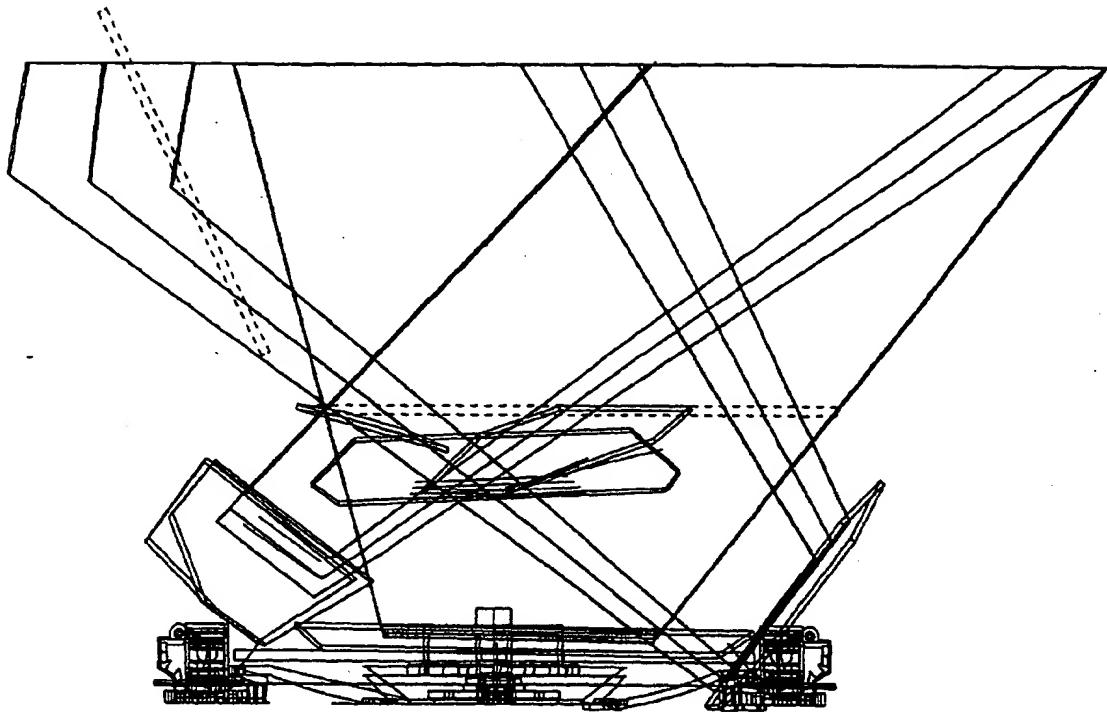


FIG. 5H10

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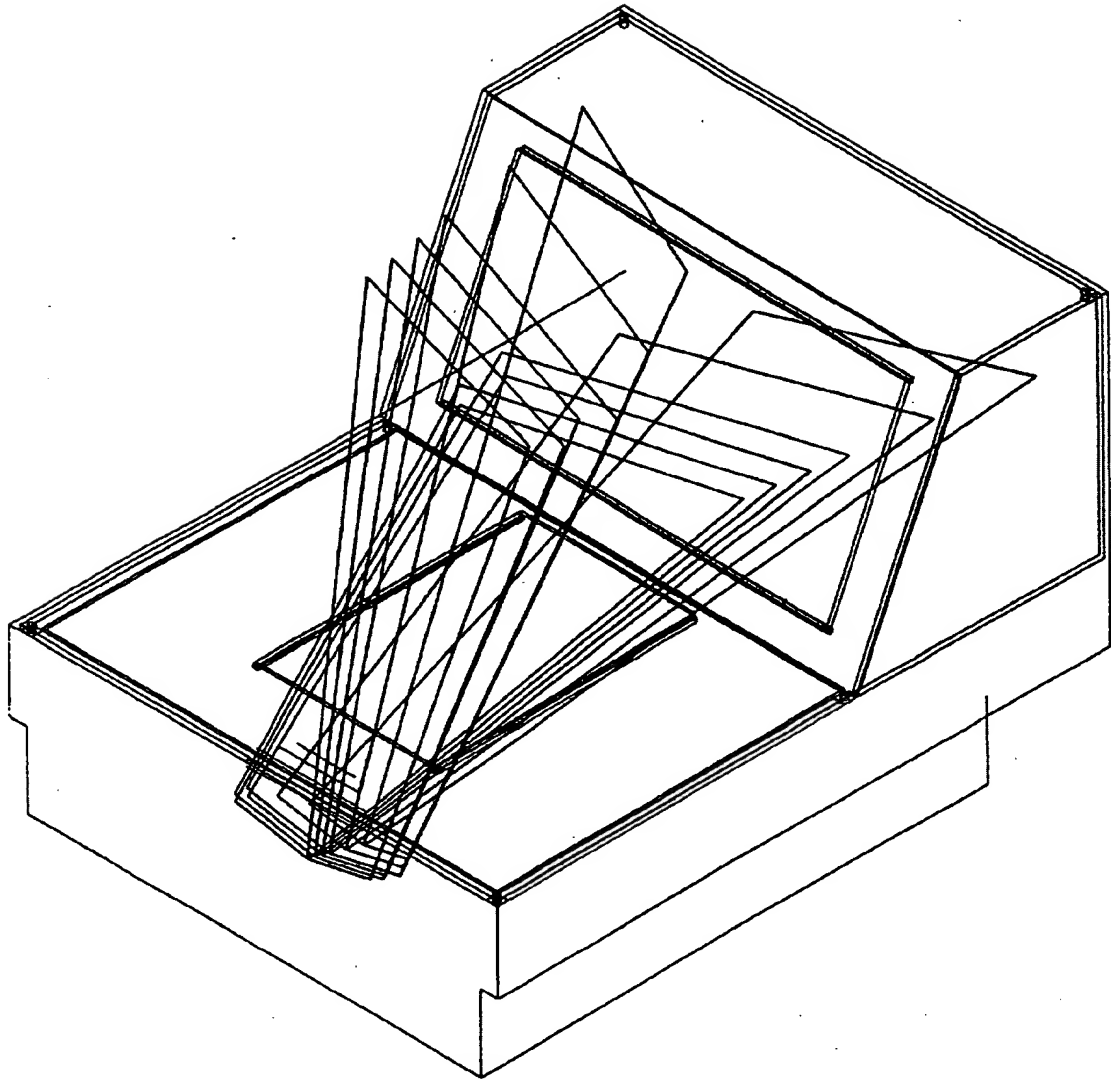


FIG. 511

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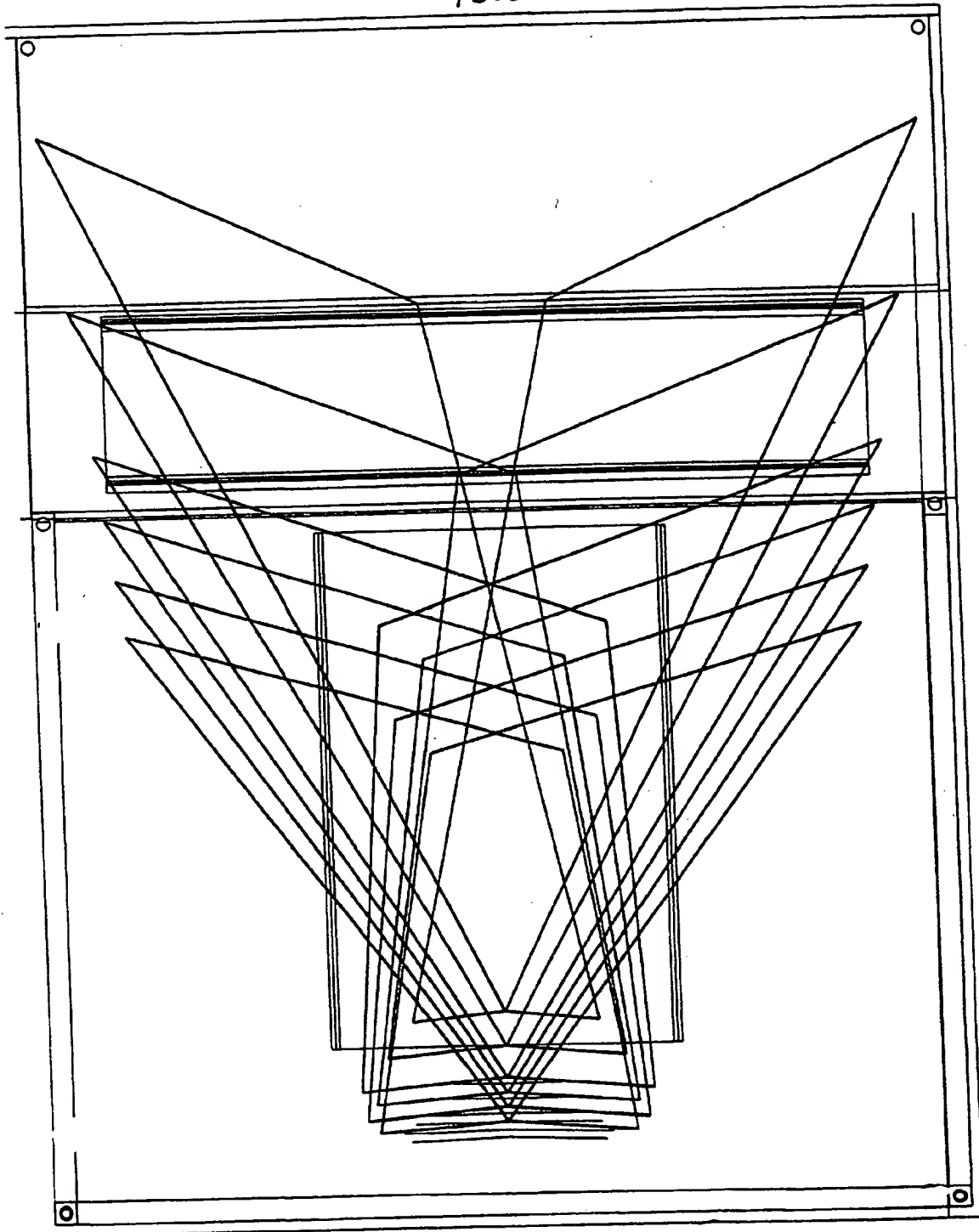


FIG. 512

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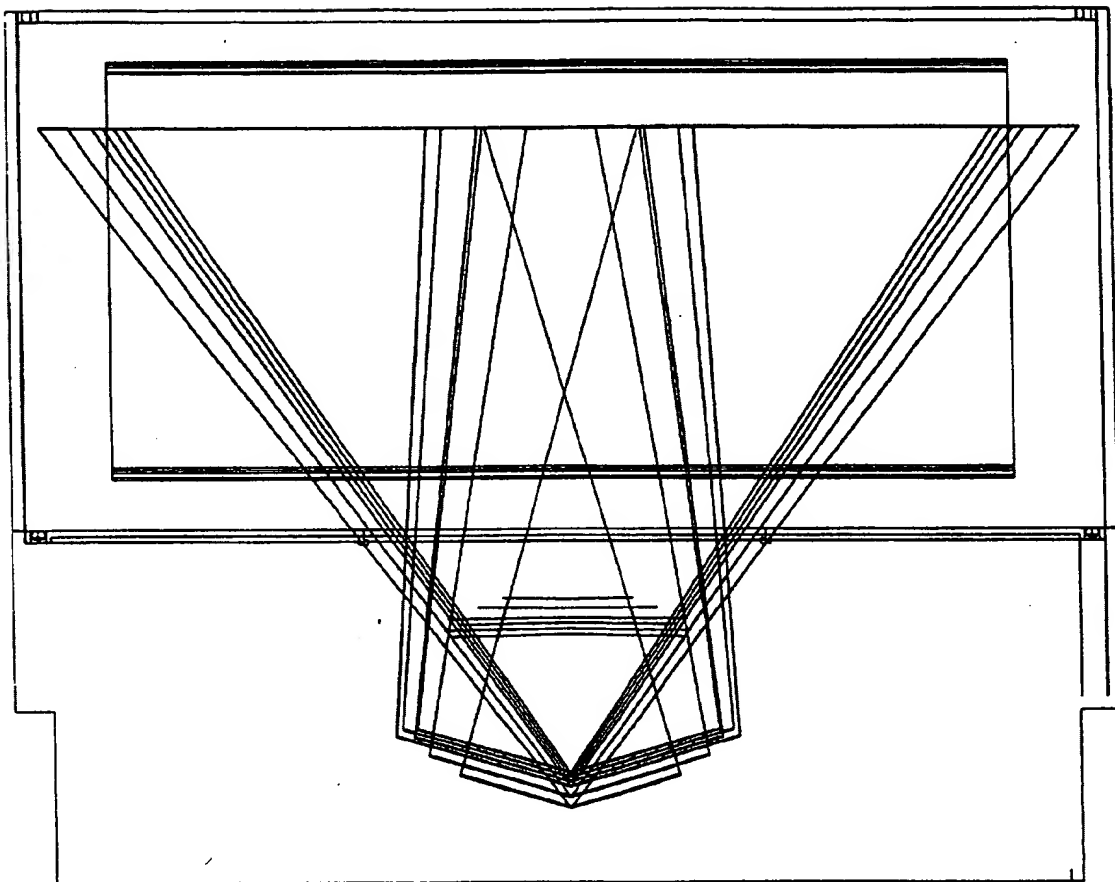


FIG. 5I3

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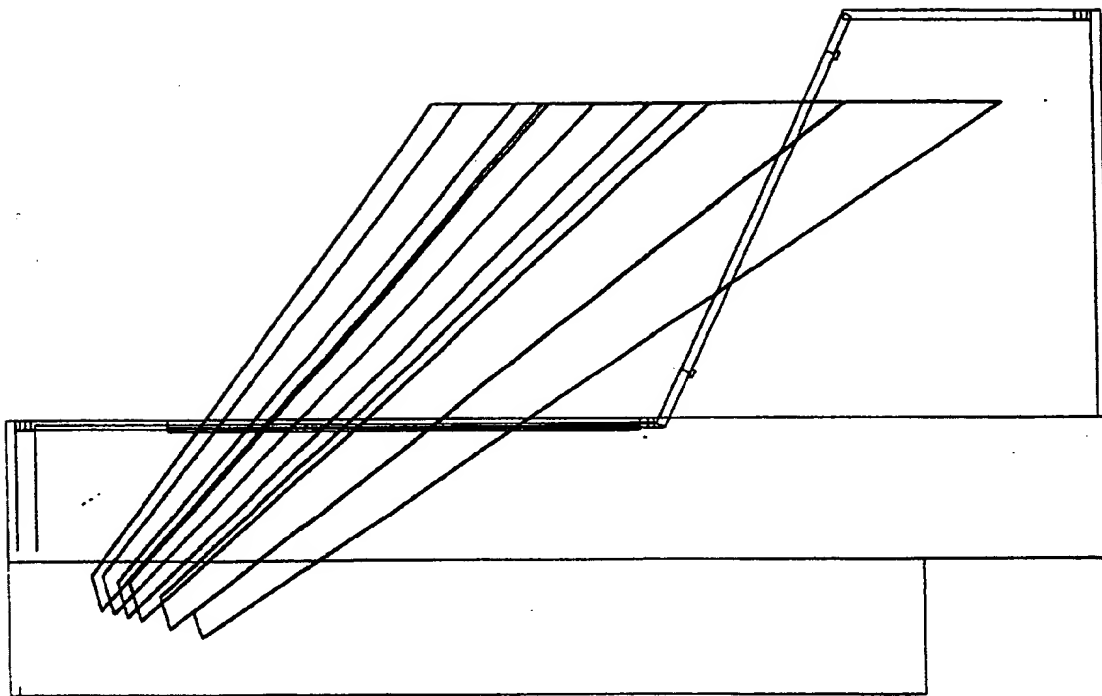


FIG. 5I4

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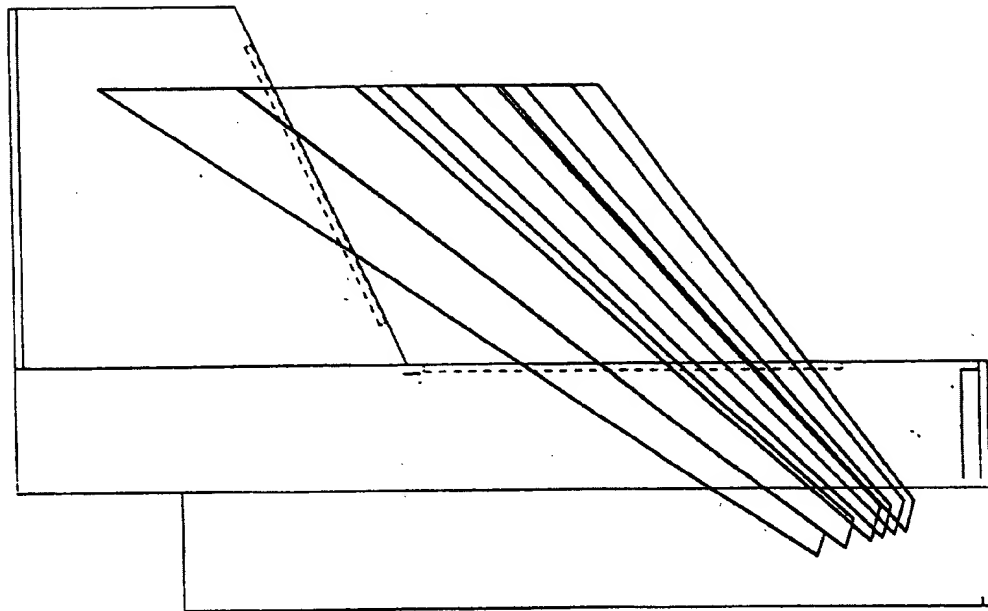


FIG. 5I5

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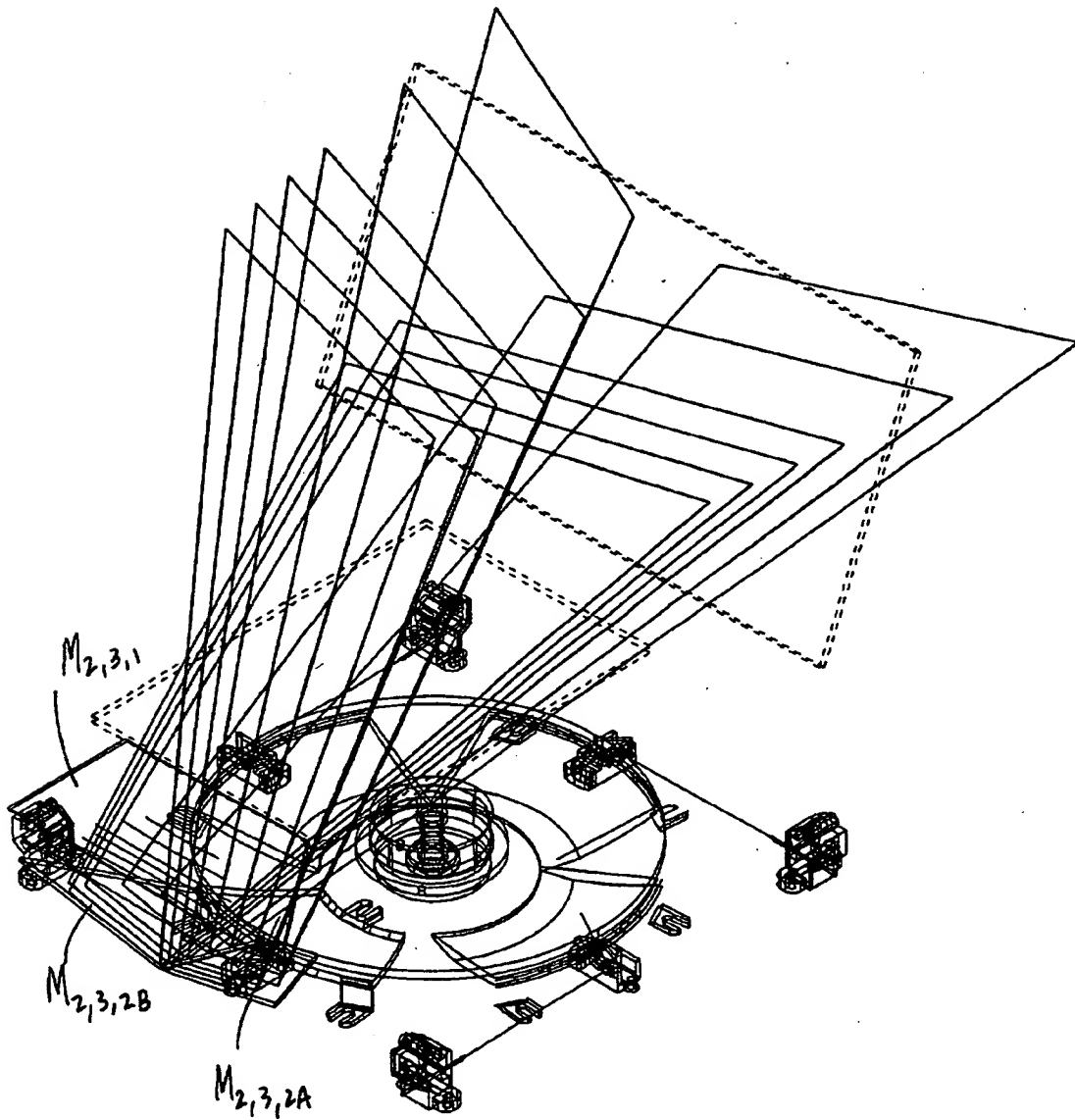


FIG 5J1

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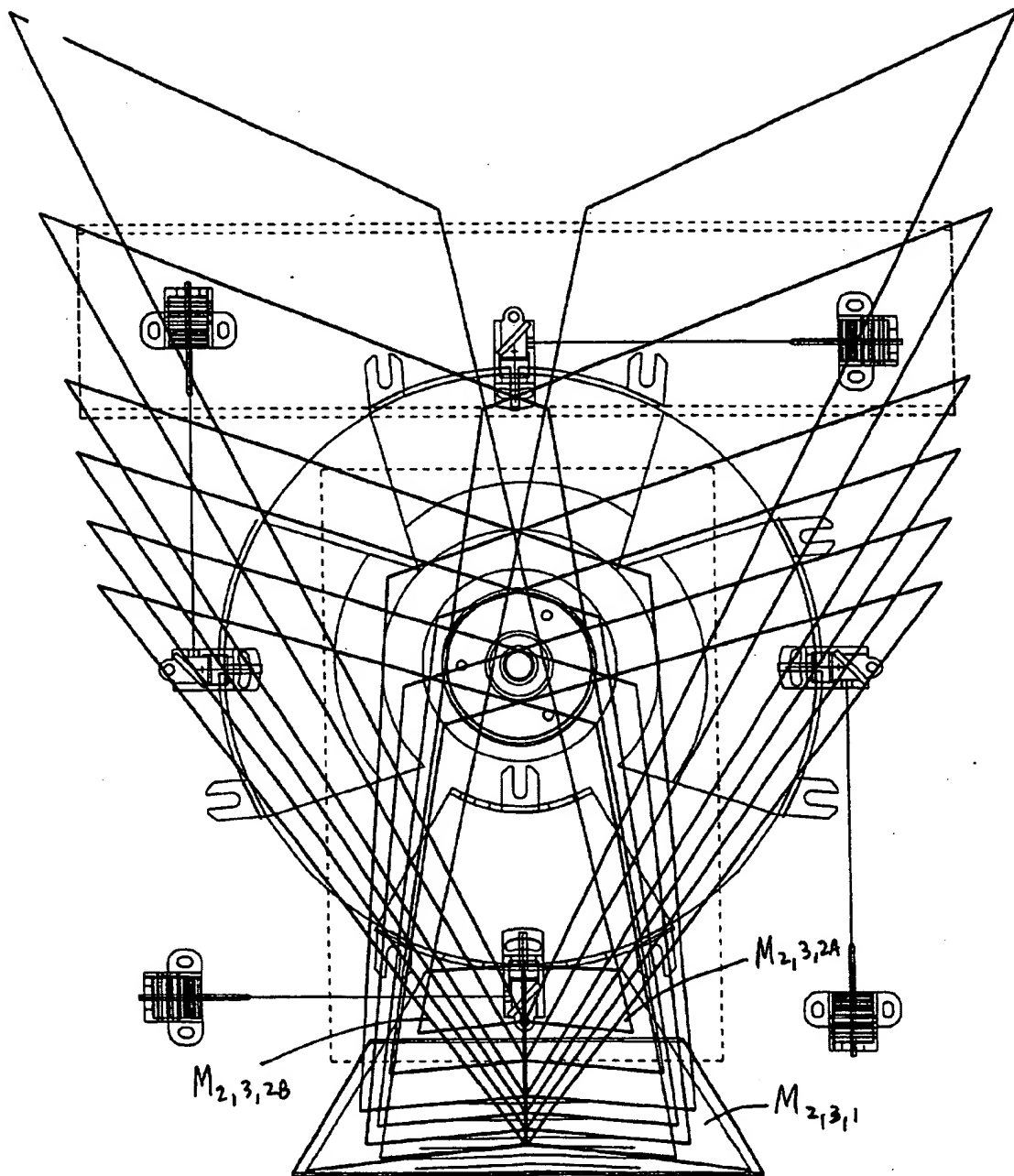


FIG. 5J2

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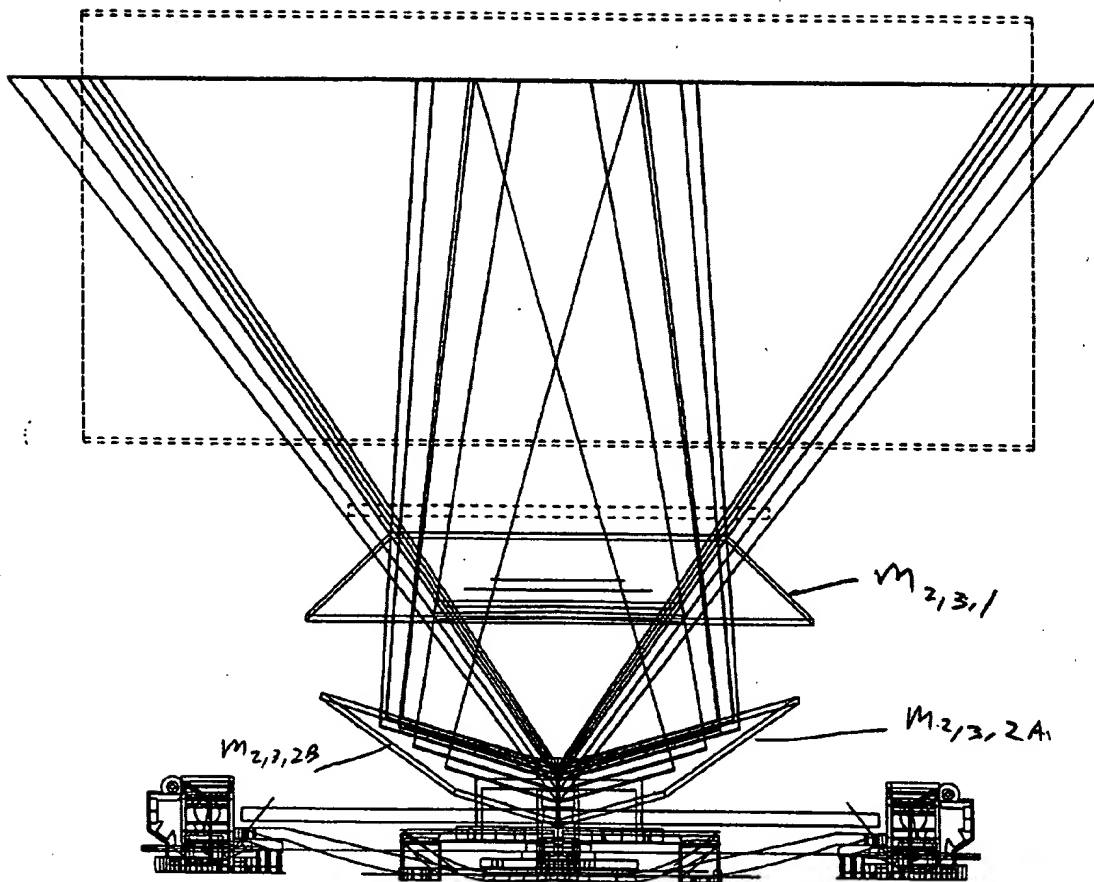


FIG 5J3

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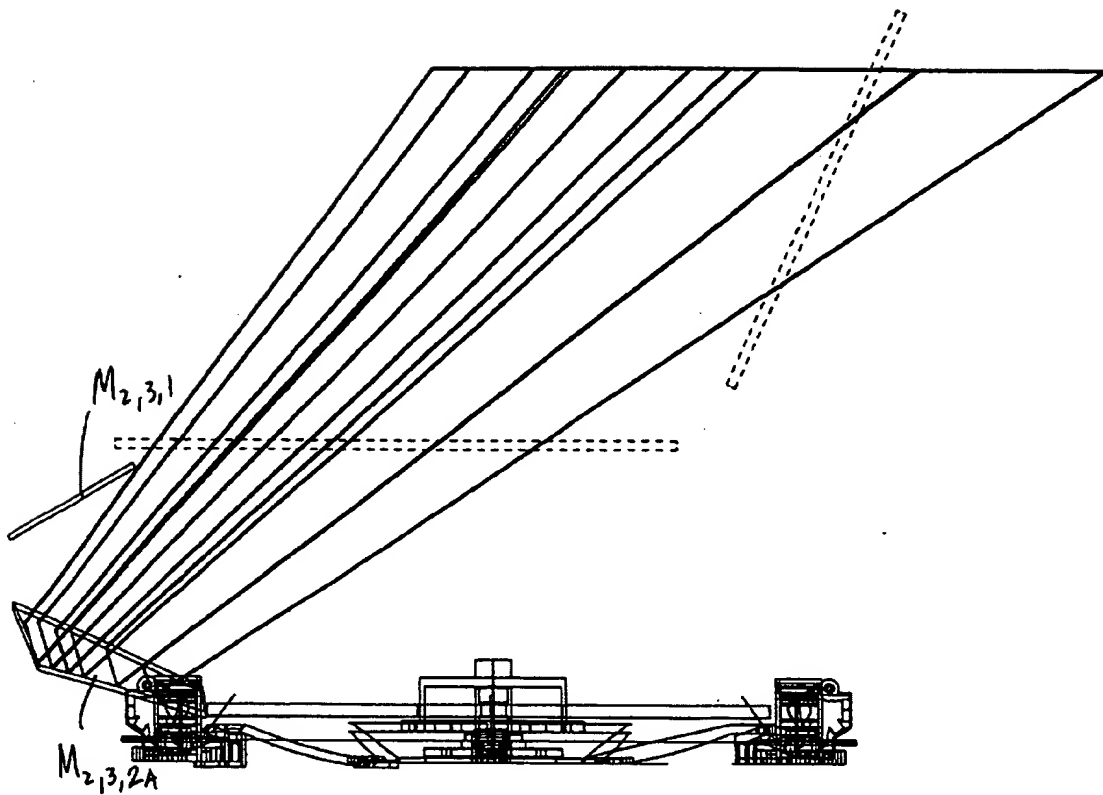


FIG. 5J4

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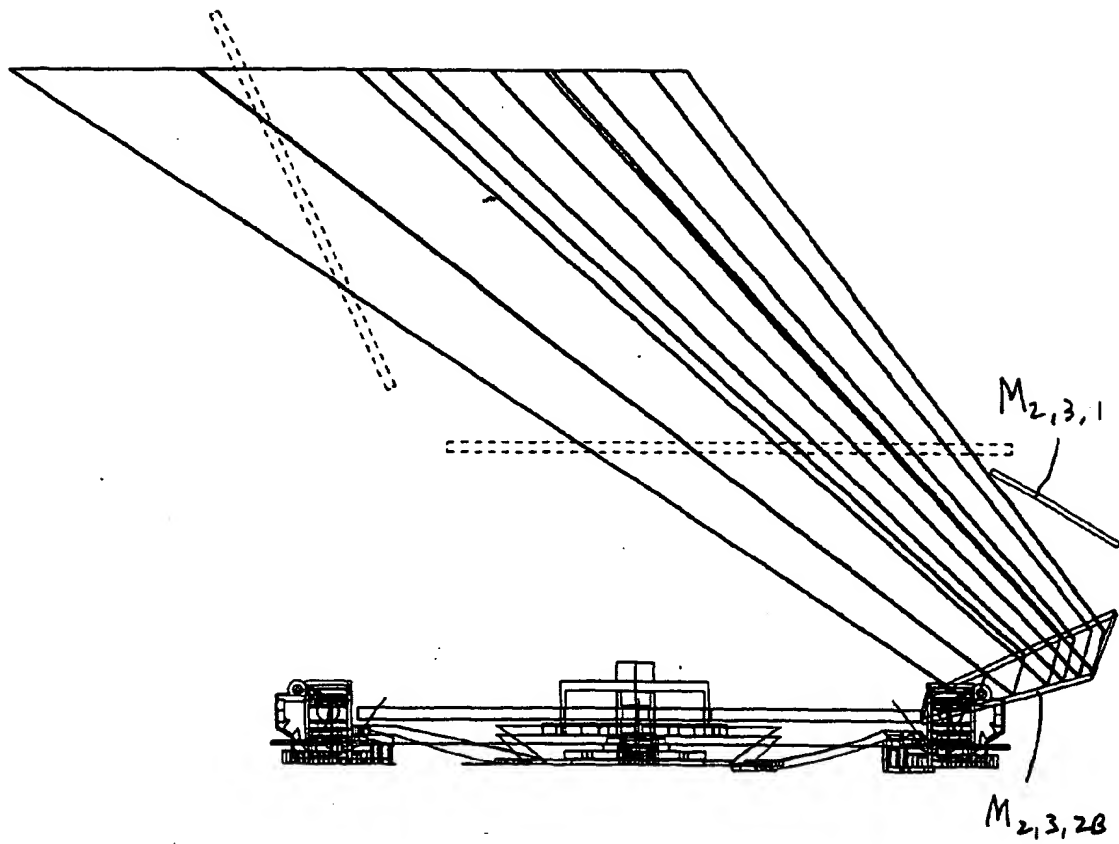


FIG. 5J5

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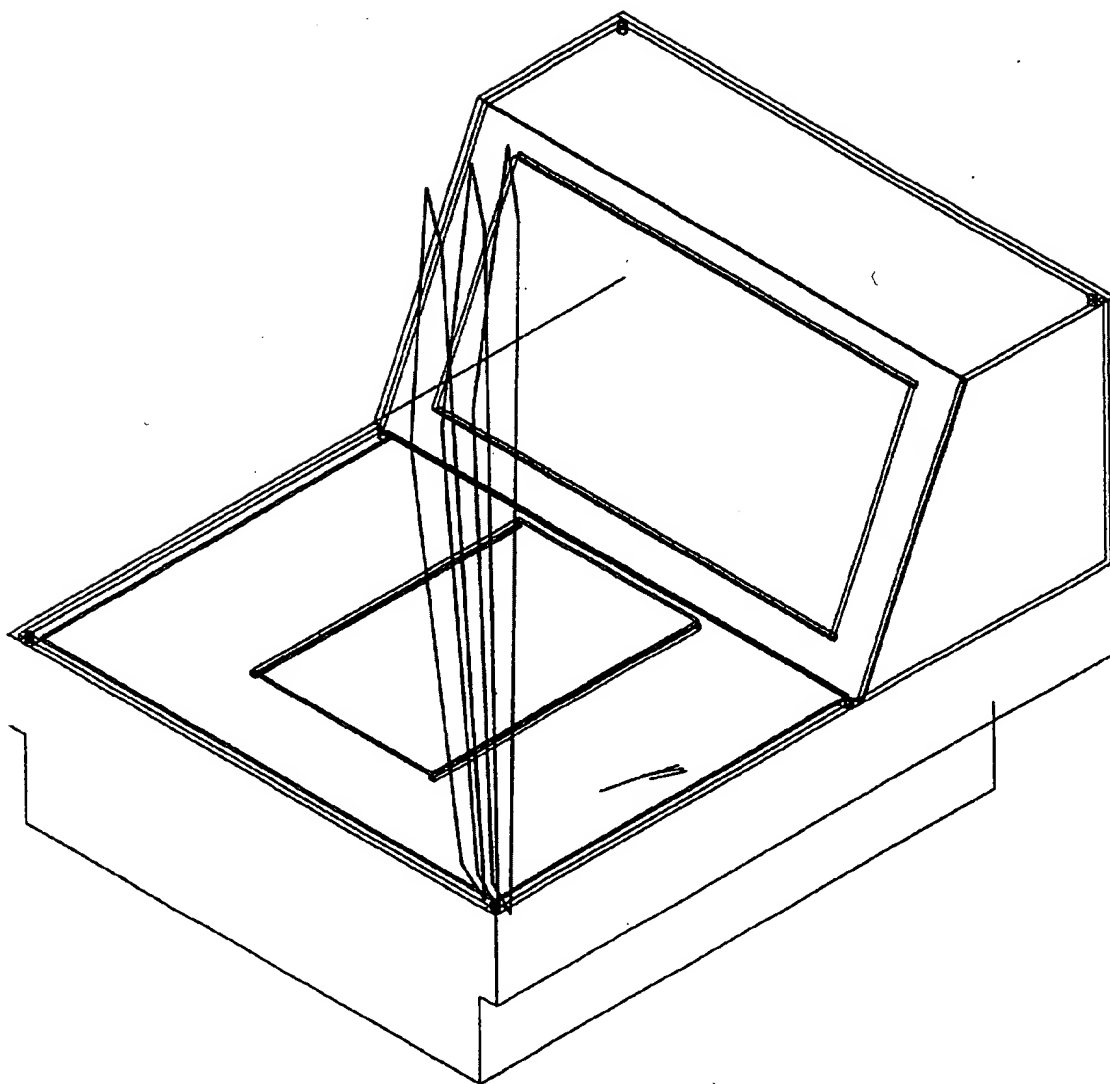


FIG. 5K1

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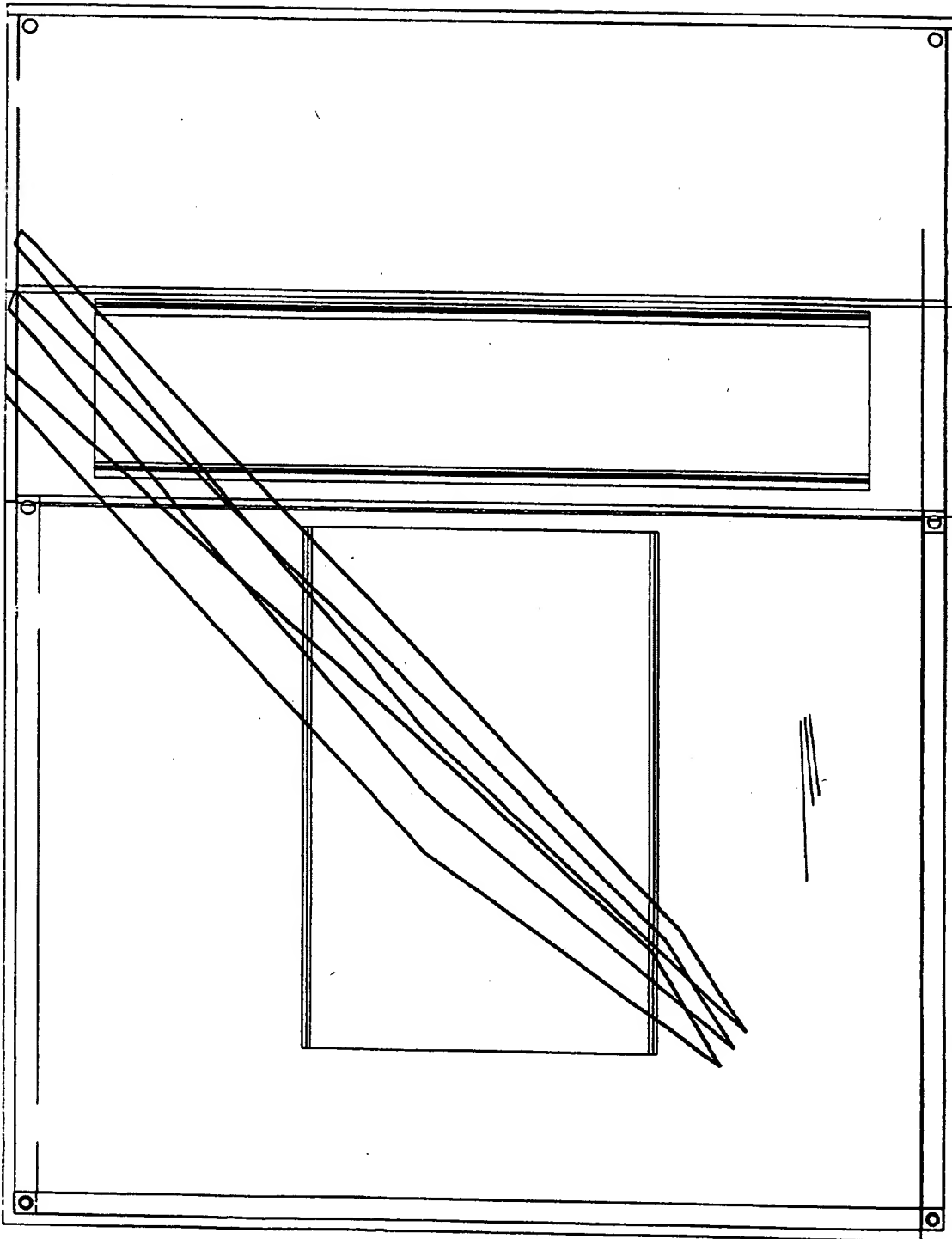


FIG. 5K2

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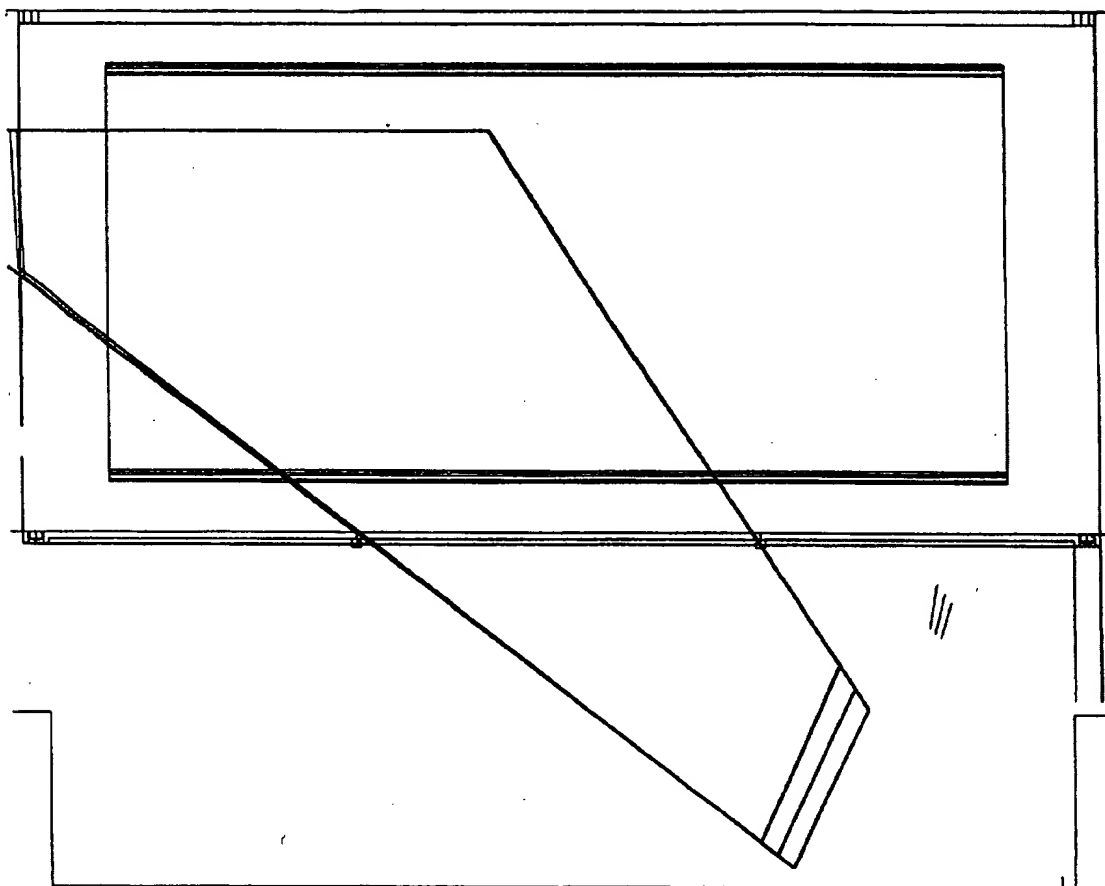


FIG 5K3

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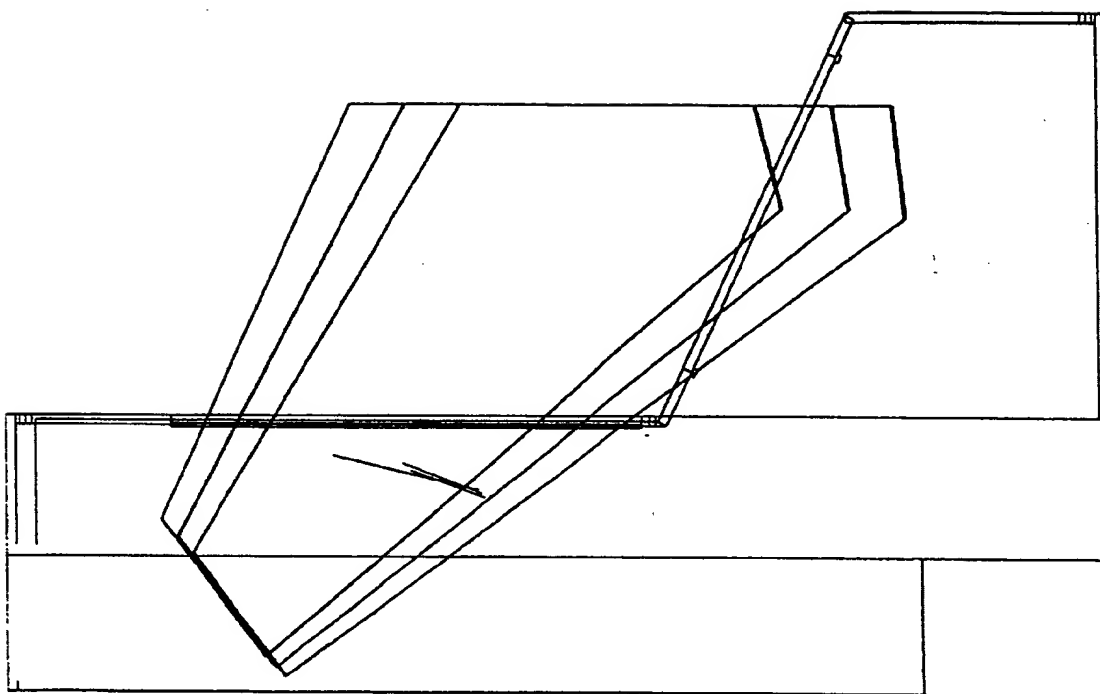


FIG. 5K4

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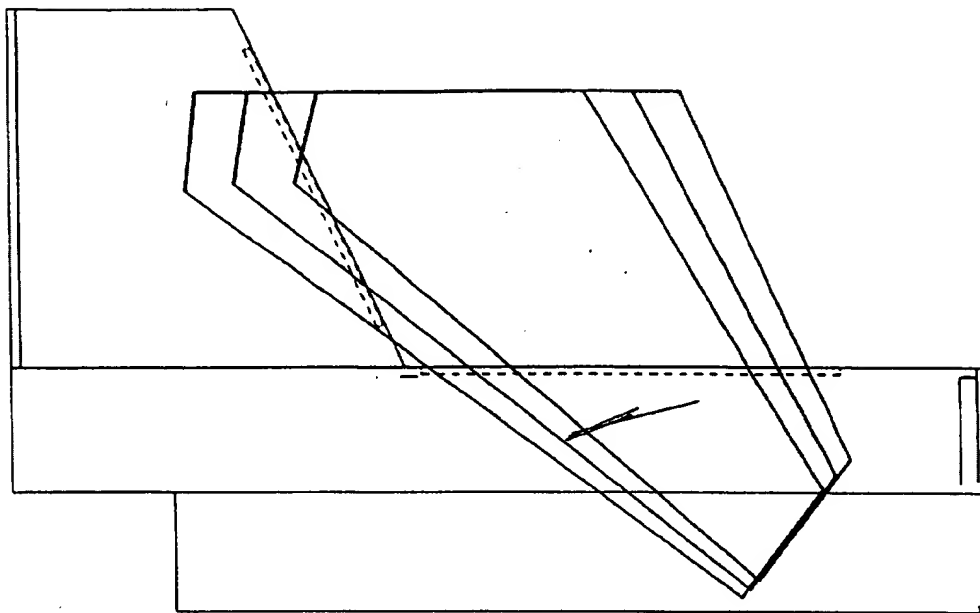
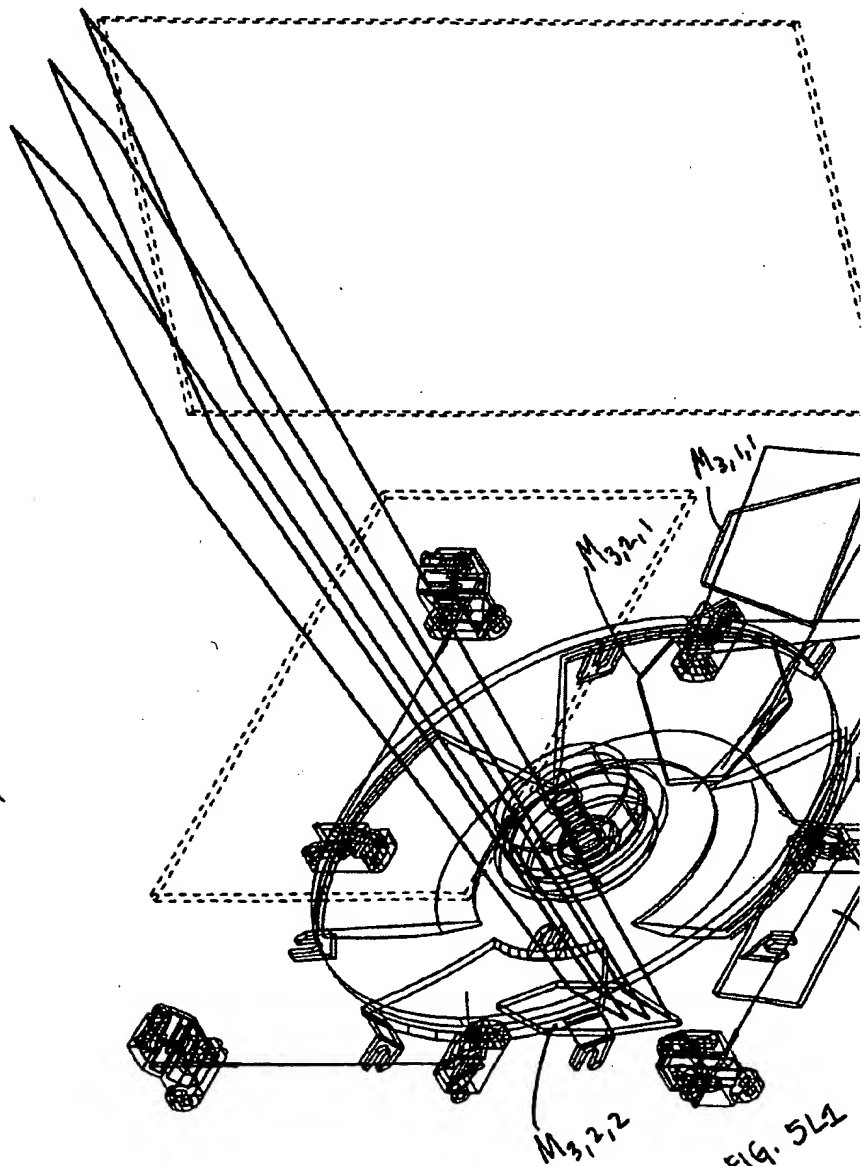


FIG. 5K5

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FIG. 5L1



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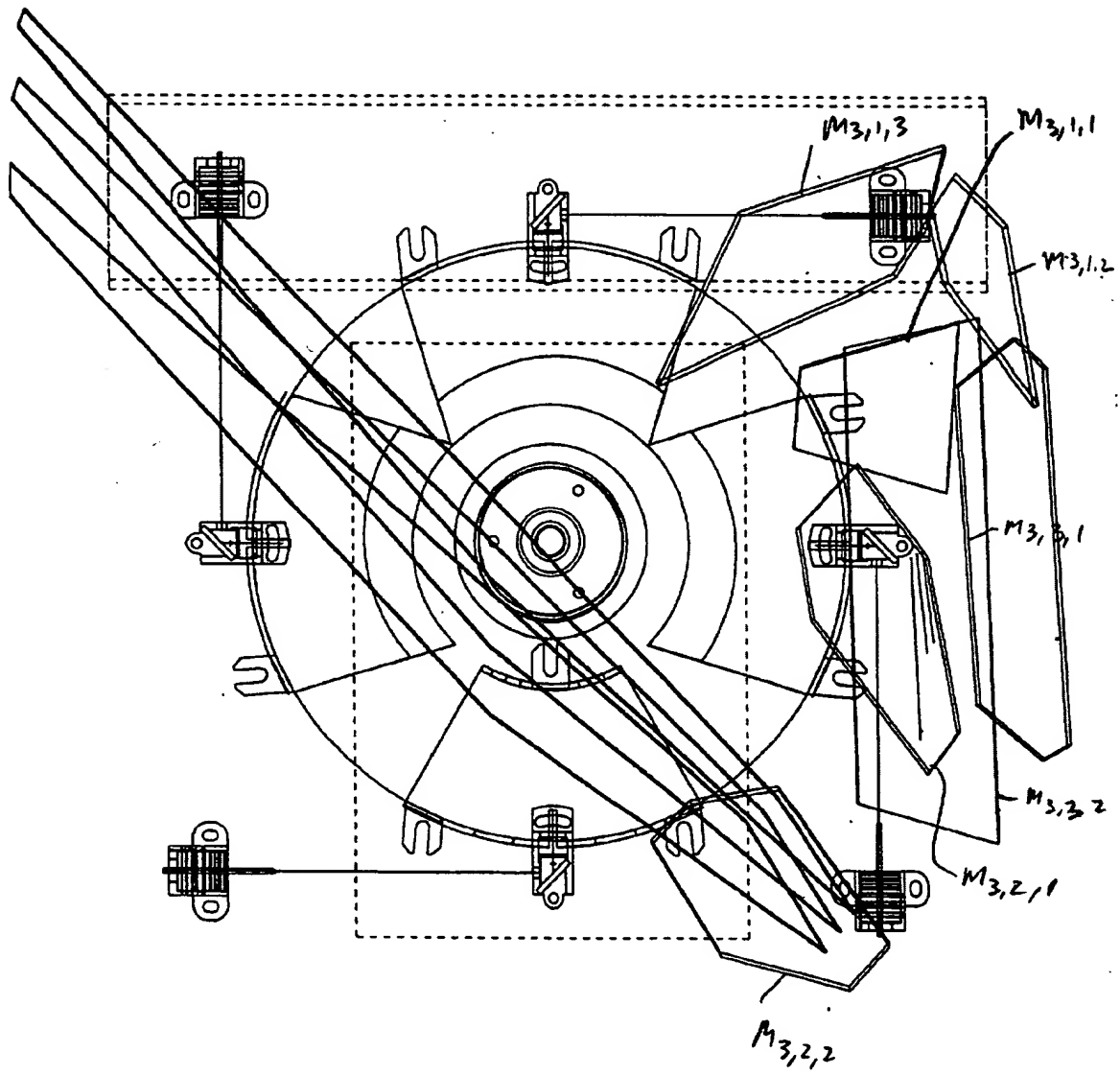


FIG. 5L2

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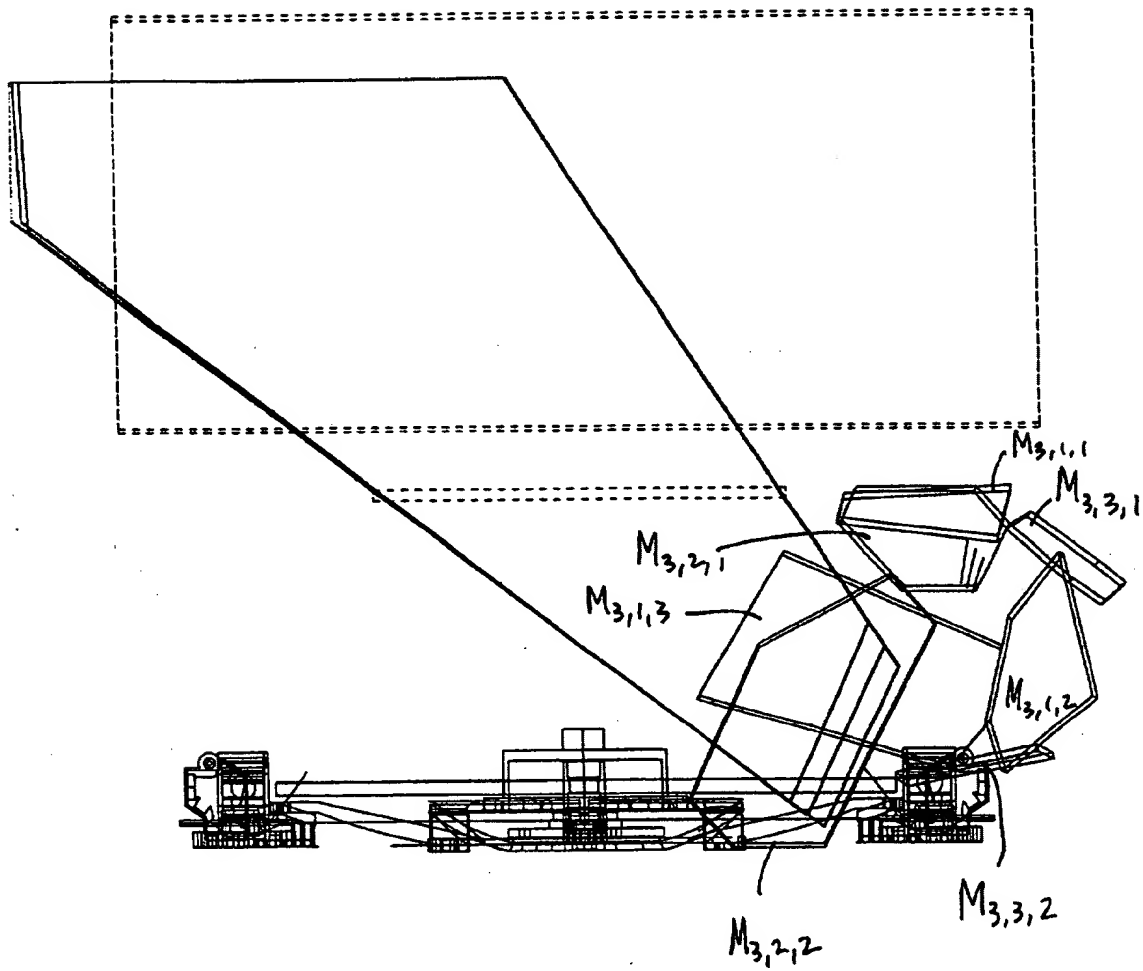


FIG. 5L3

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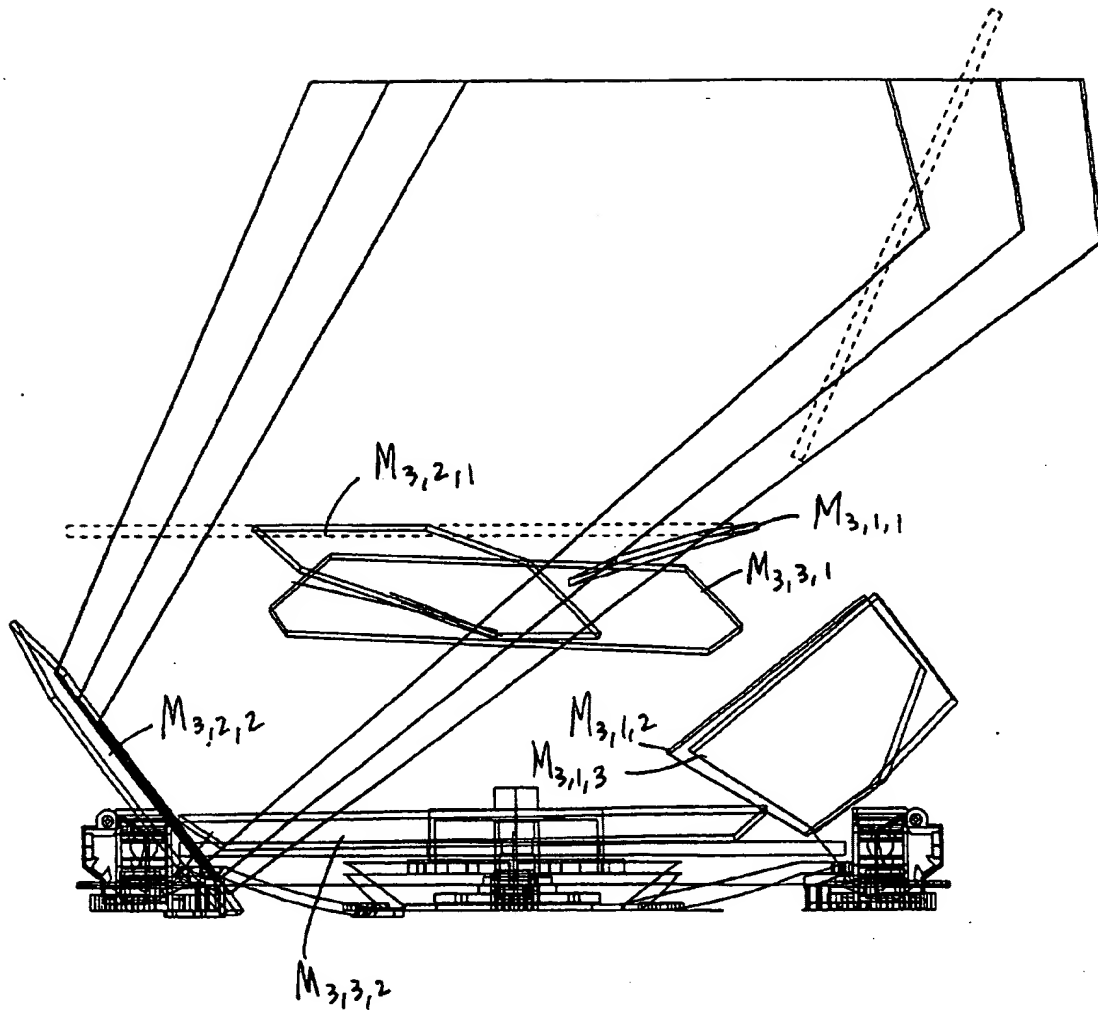


FIG. 5L4

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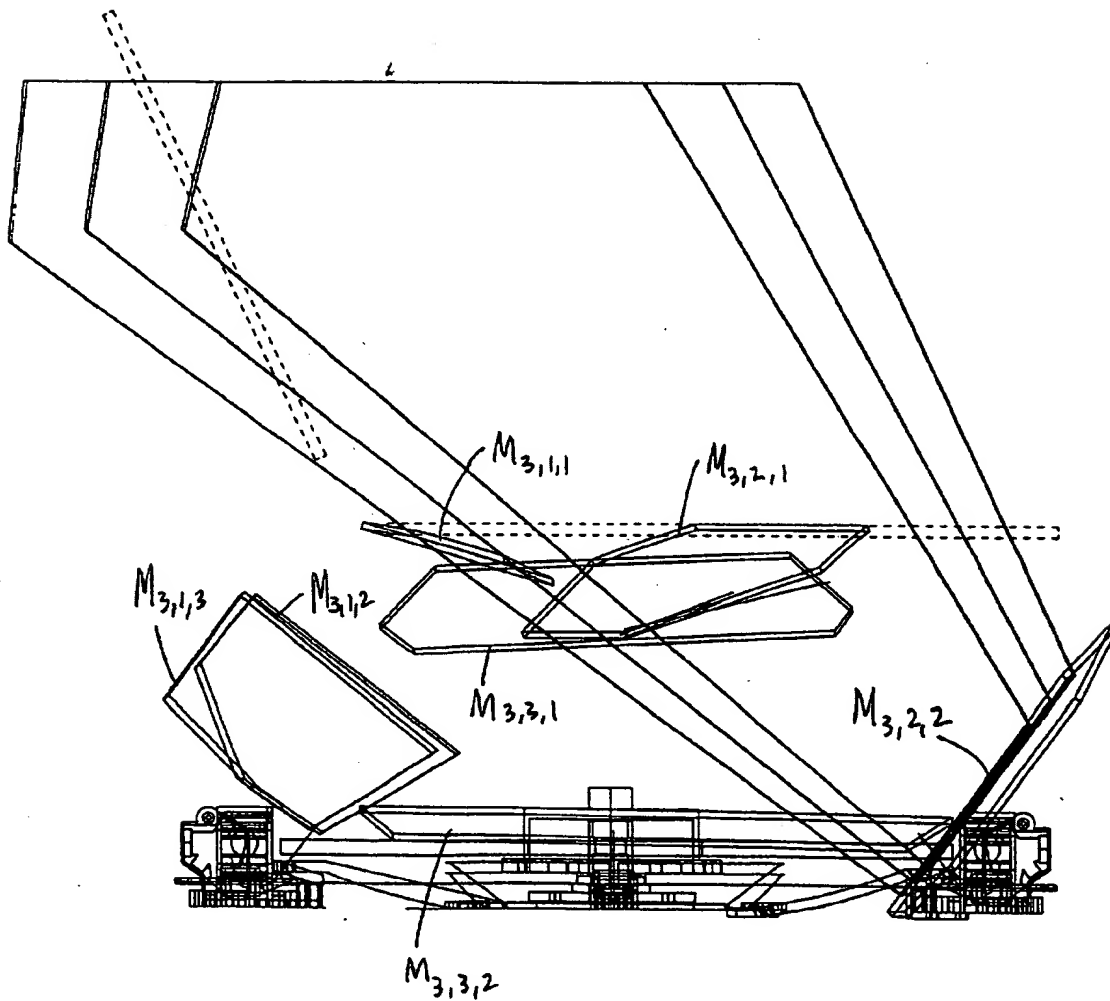


FIG. 5L5

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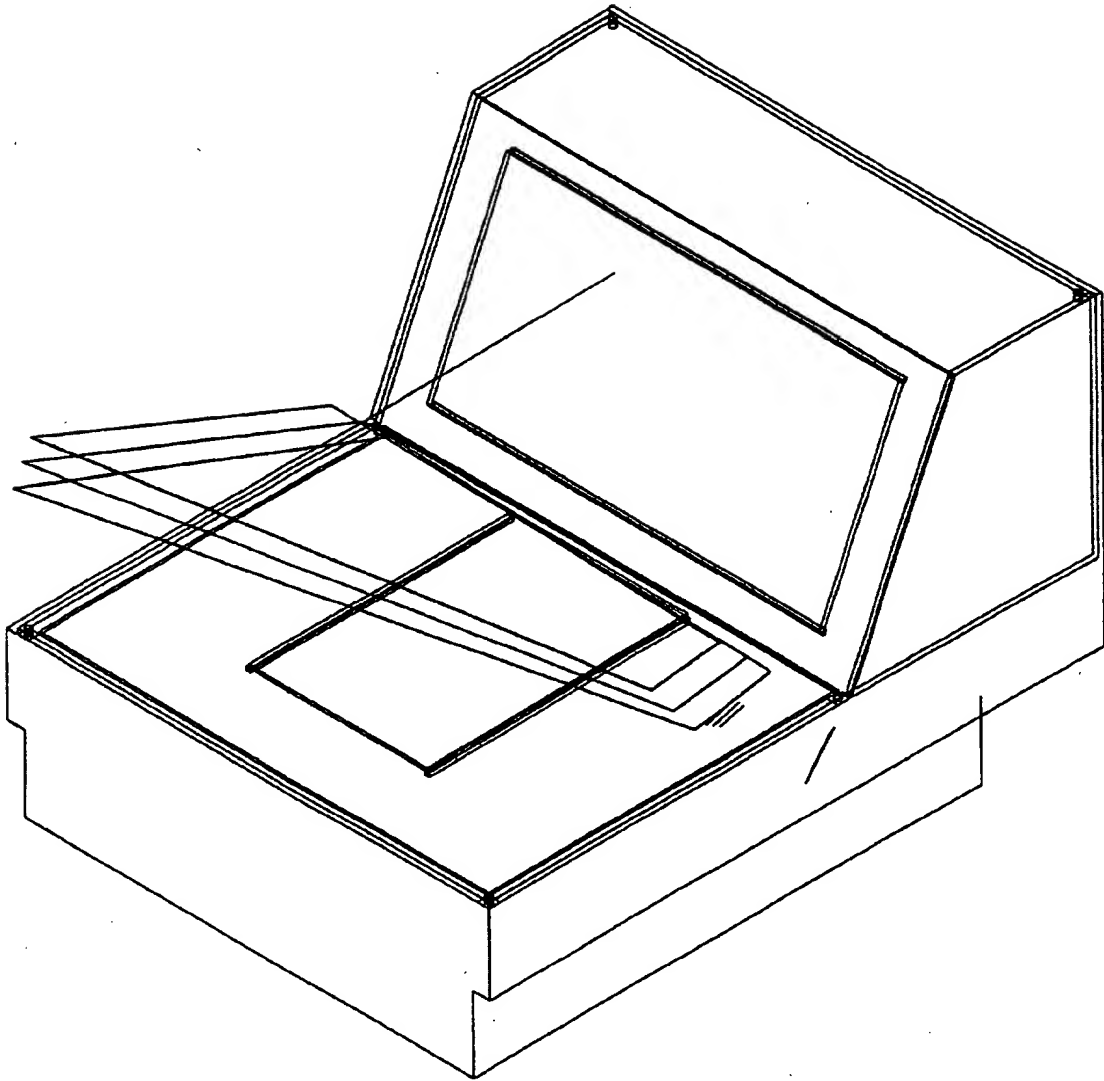


FIG. 5M1

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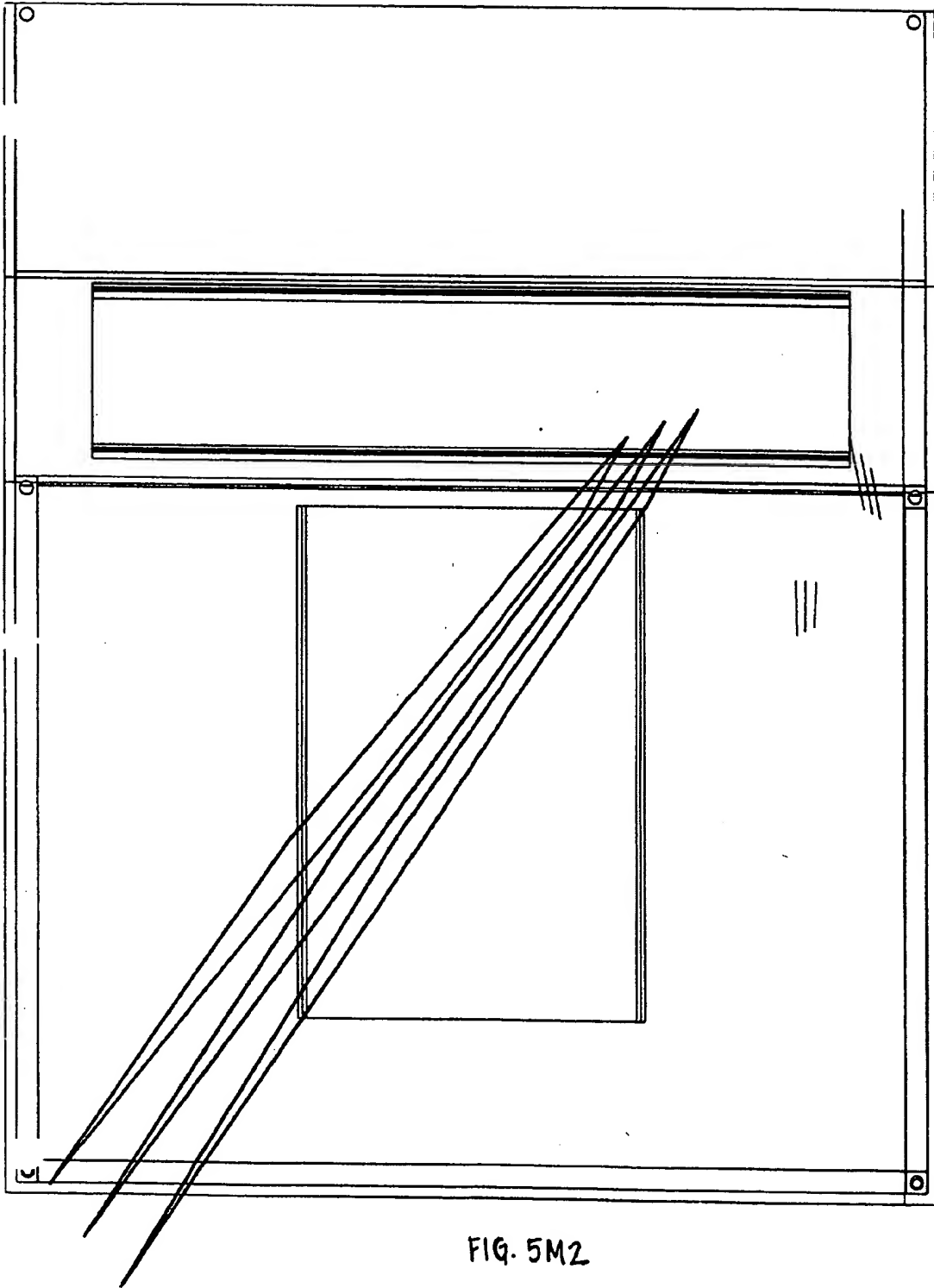


FIG. 5M2

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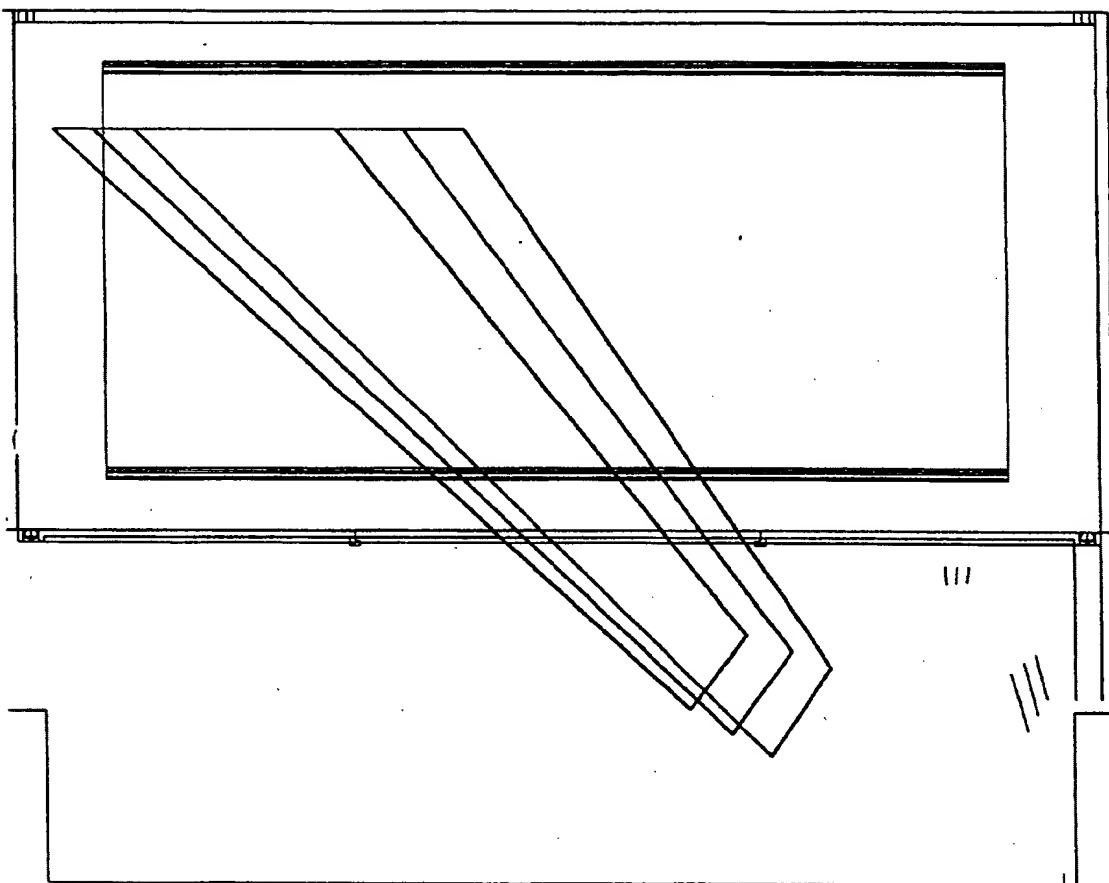


FIG. 5M3

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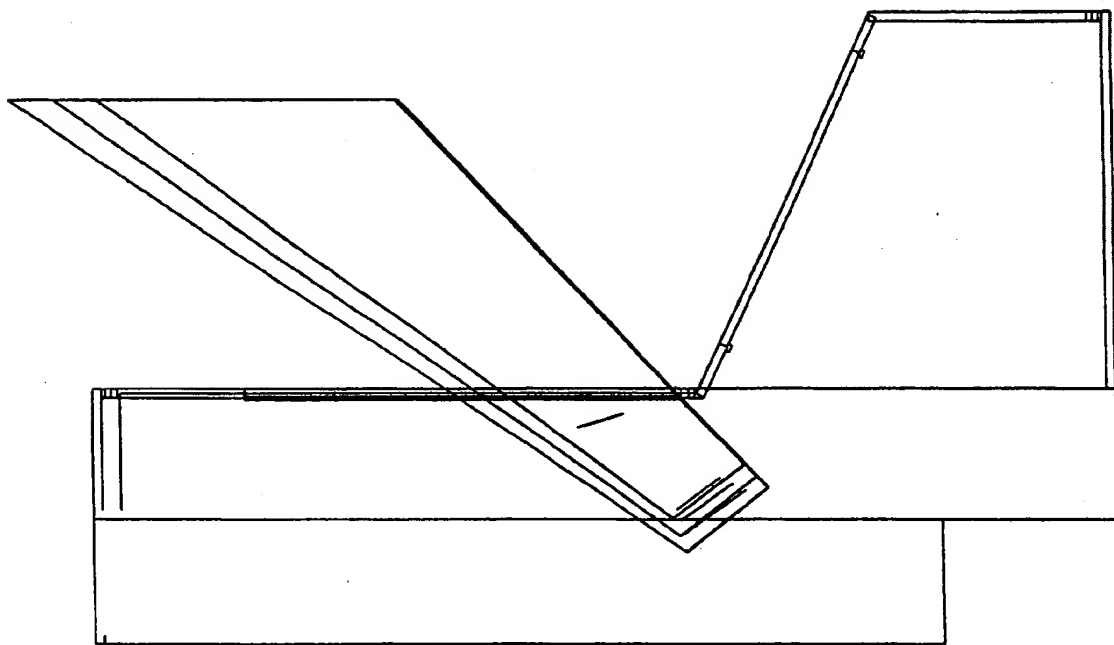


FIG. 5M4

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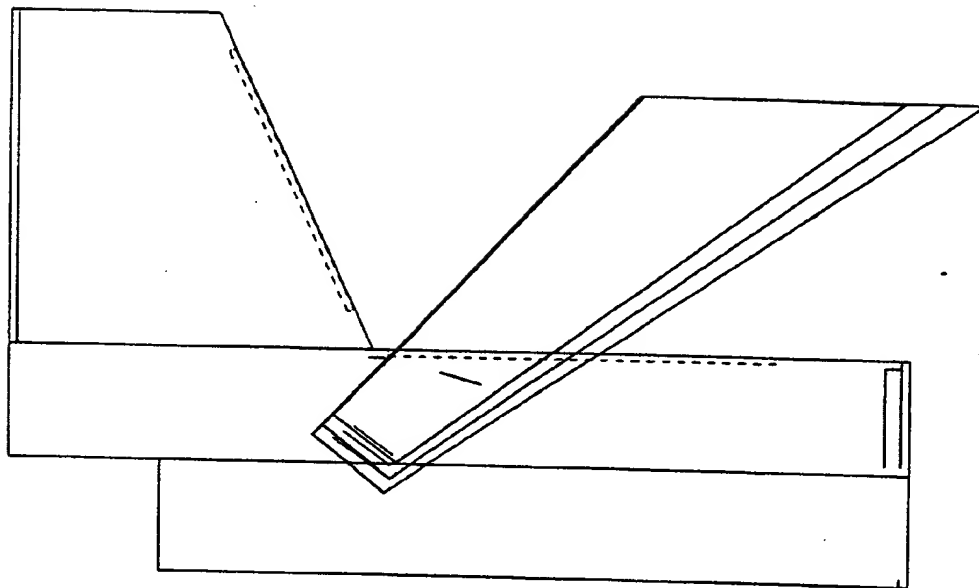


FIG. 5M5

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01037535-014004

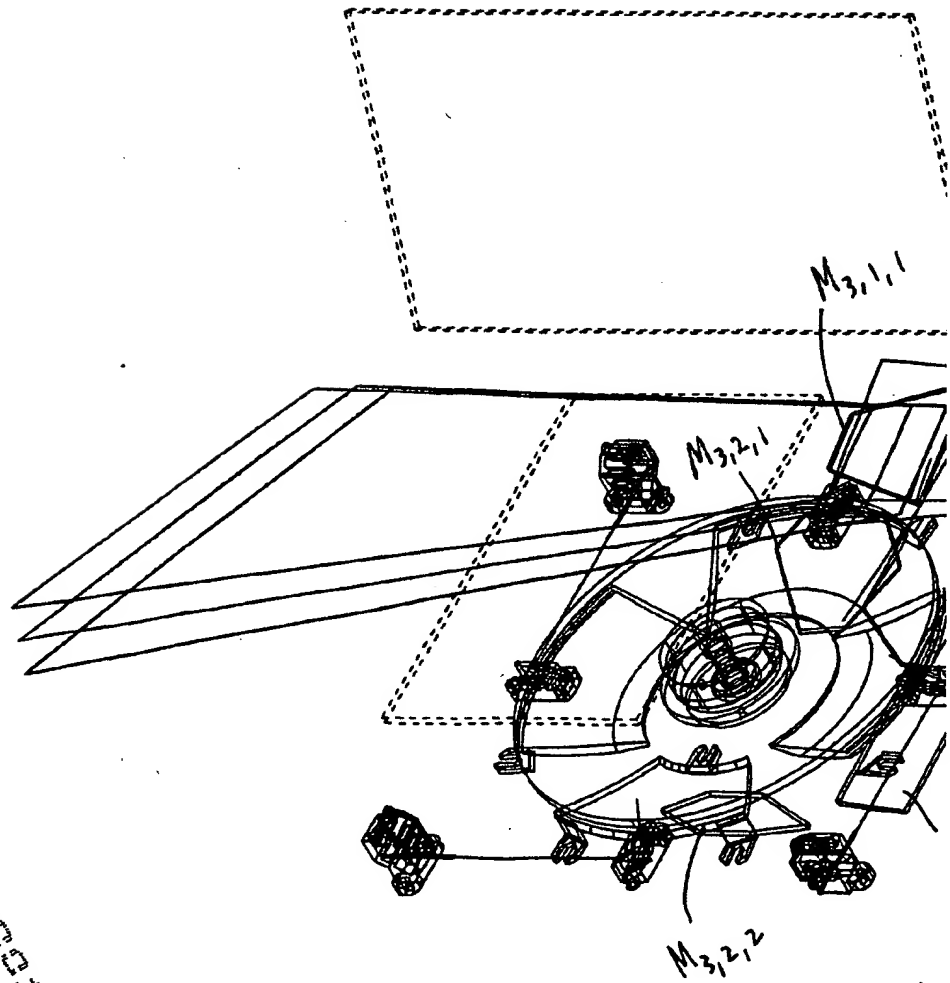


FIG. 5N1

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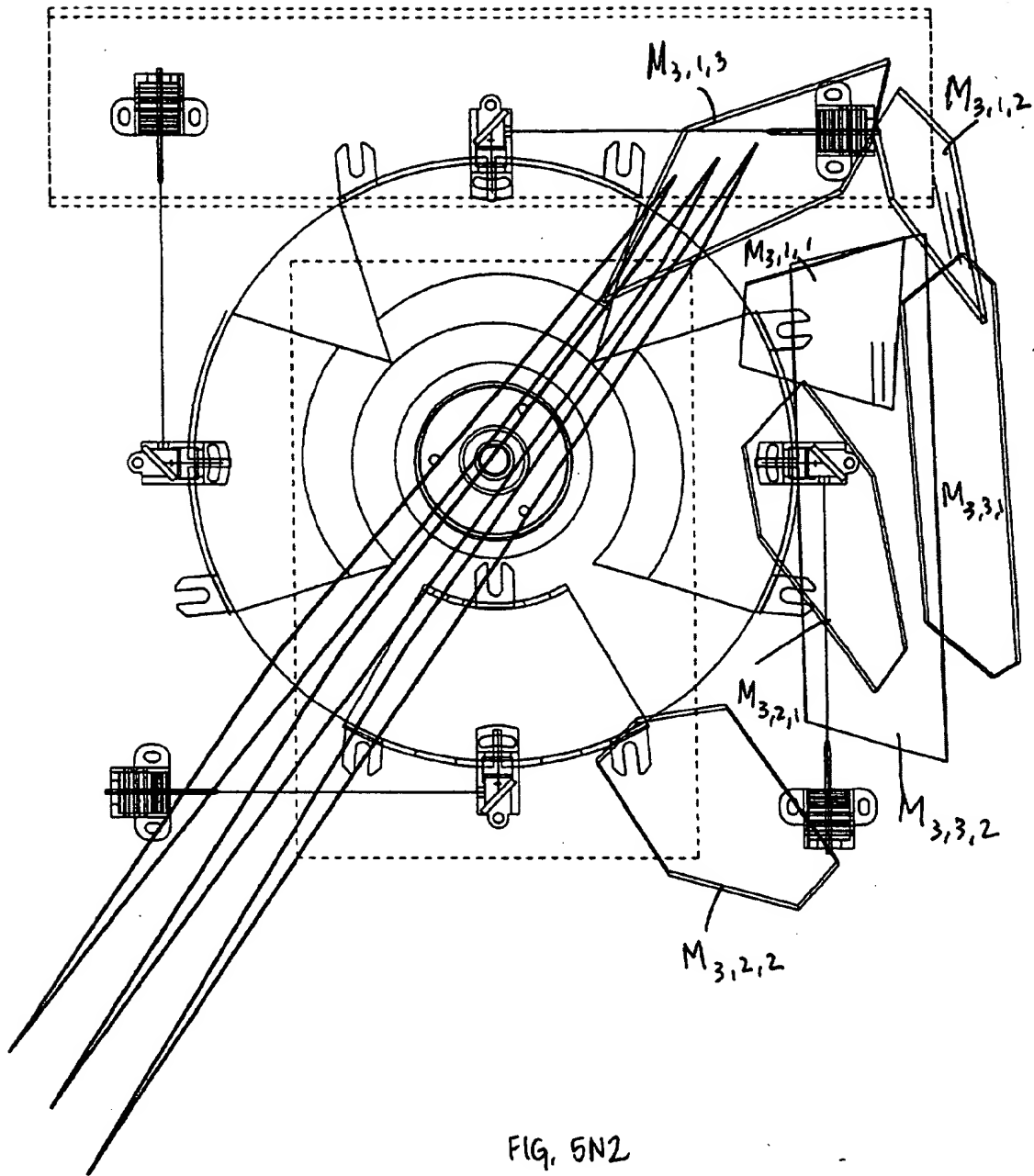


FIG. 5N2

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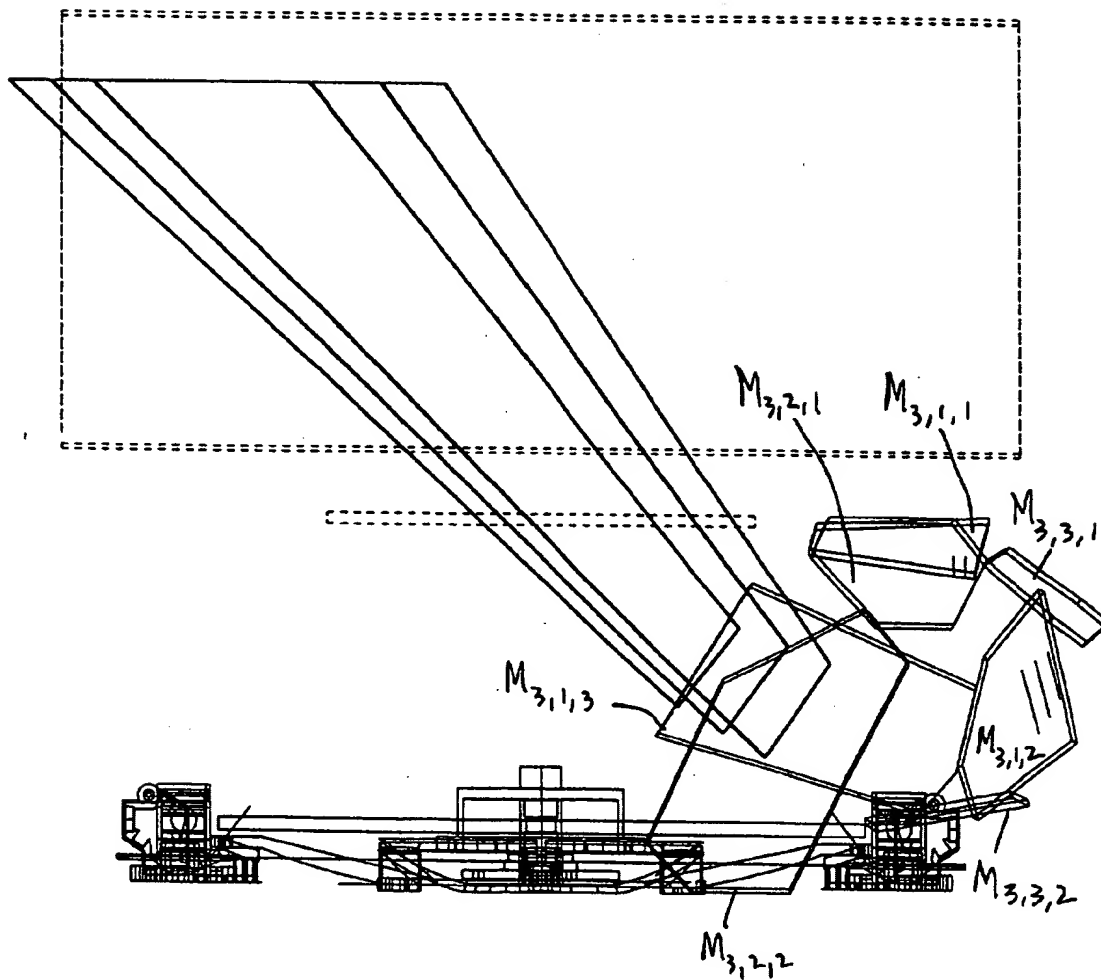


FIG. 5N3

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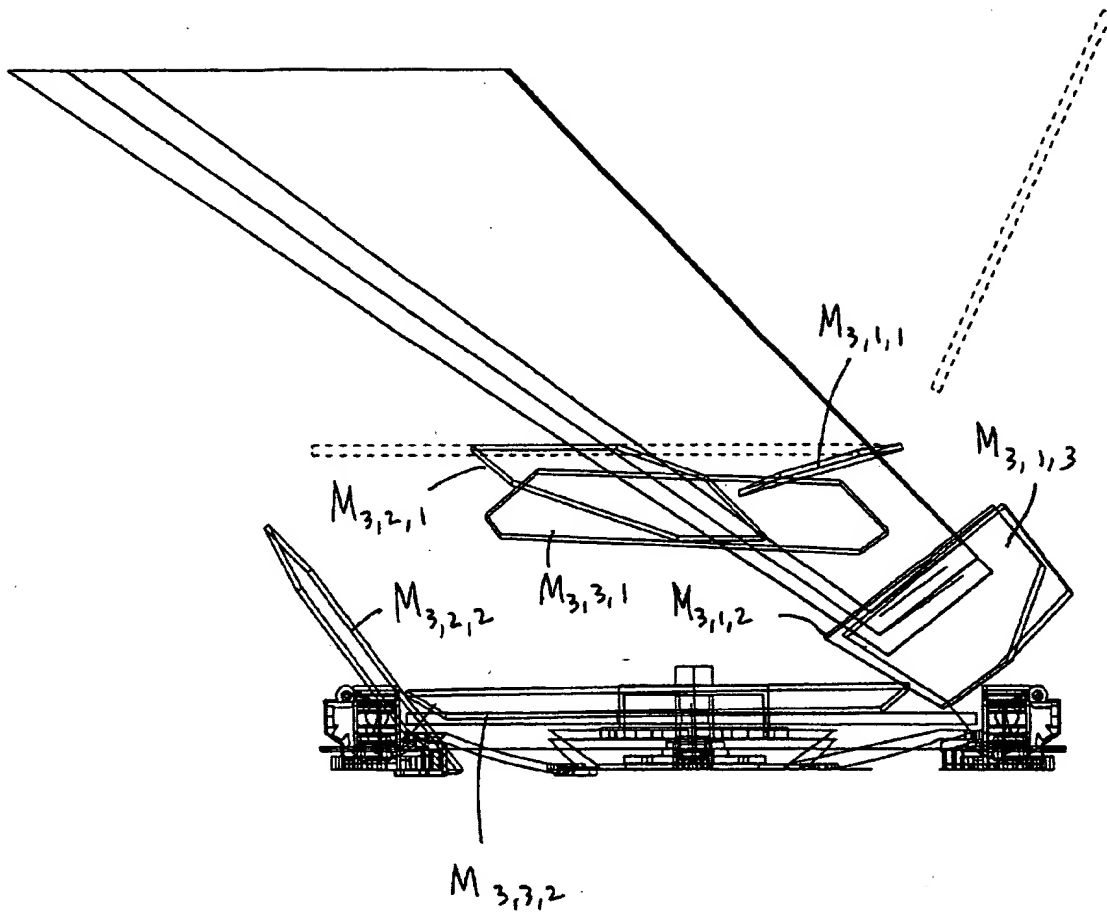


FIG. 5N4

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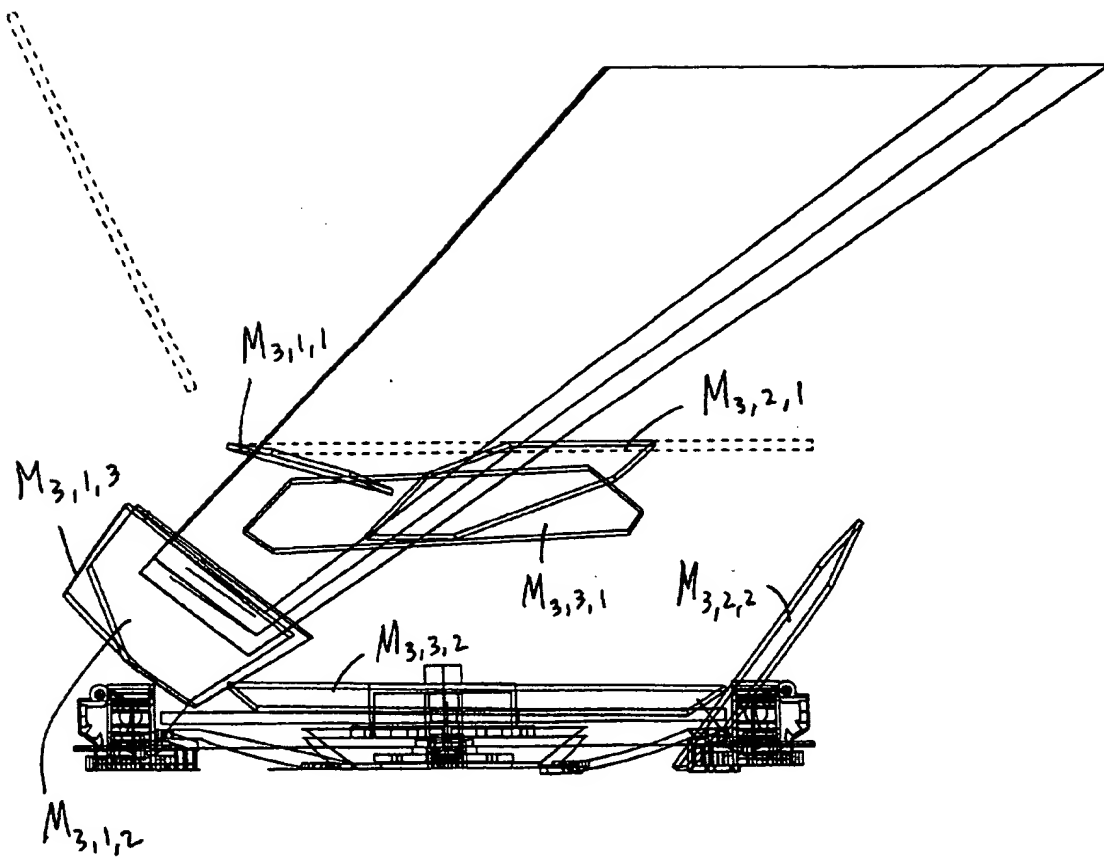


FIG. 5N5

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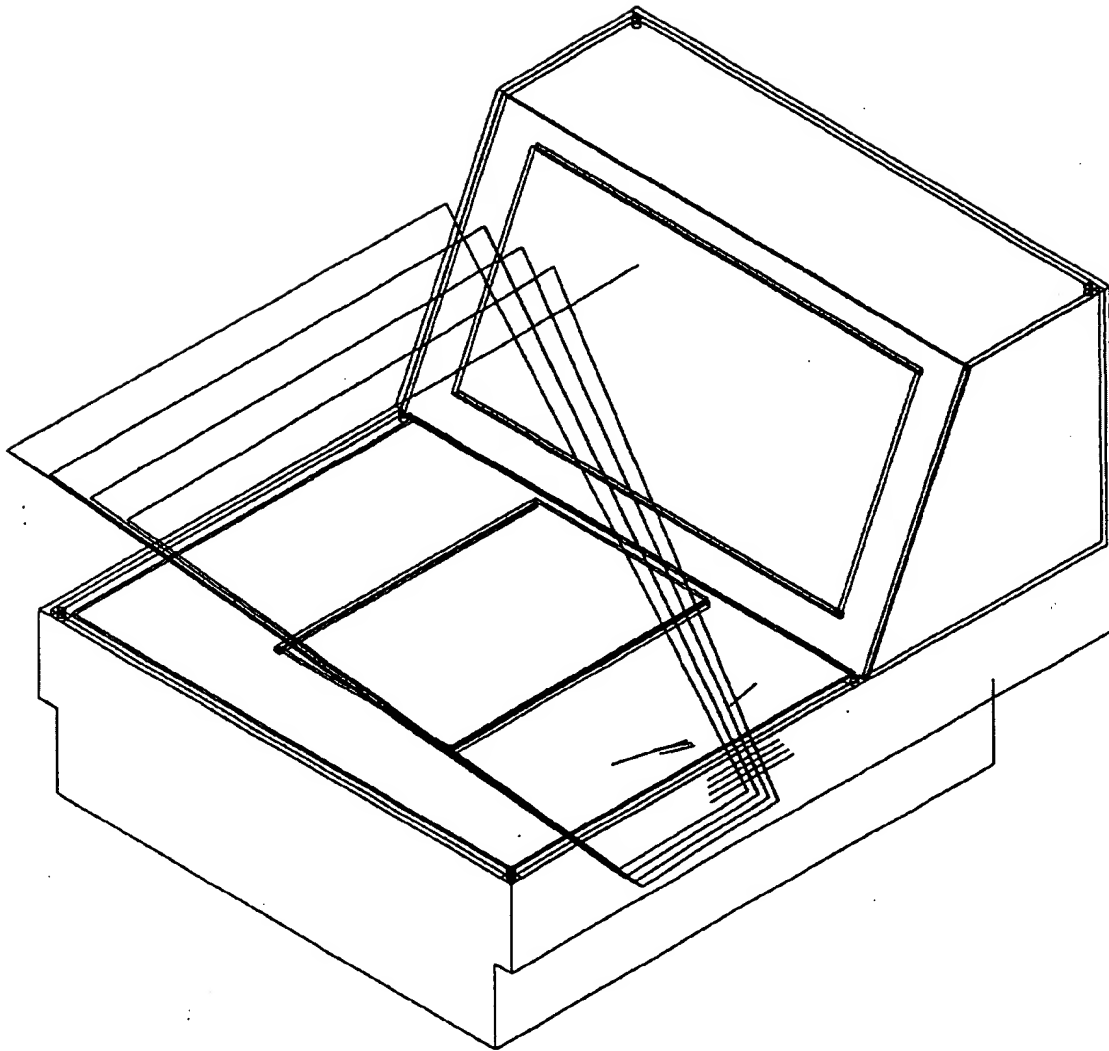


FIG. 501

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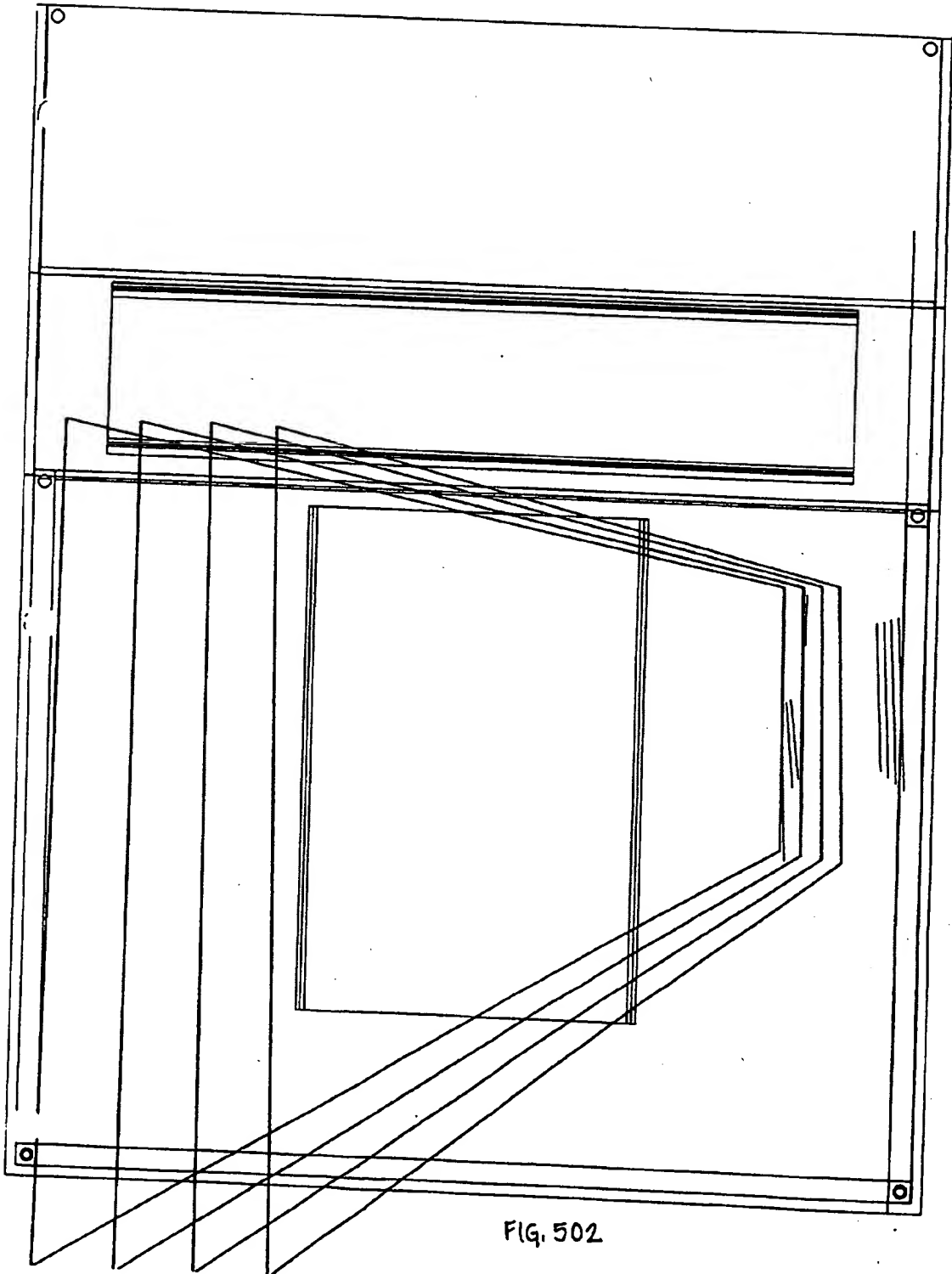


FIG. 502

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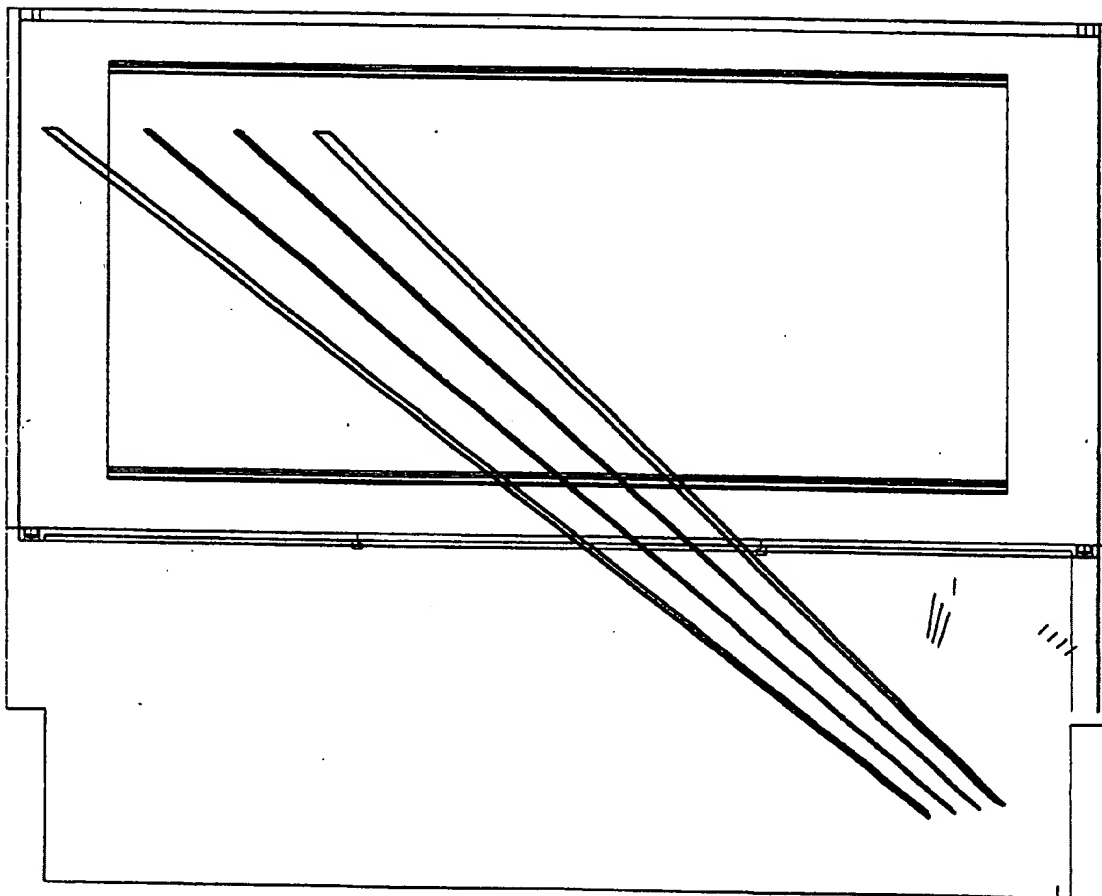


FIG. 503

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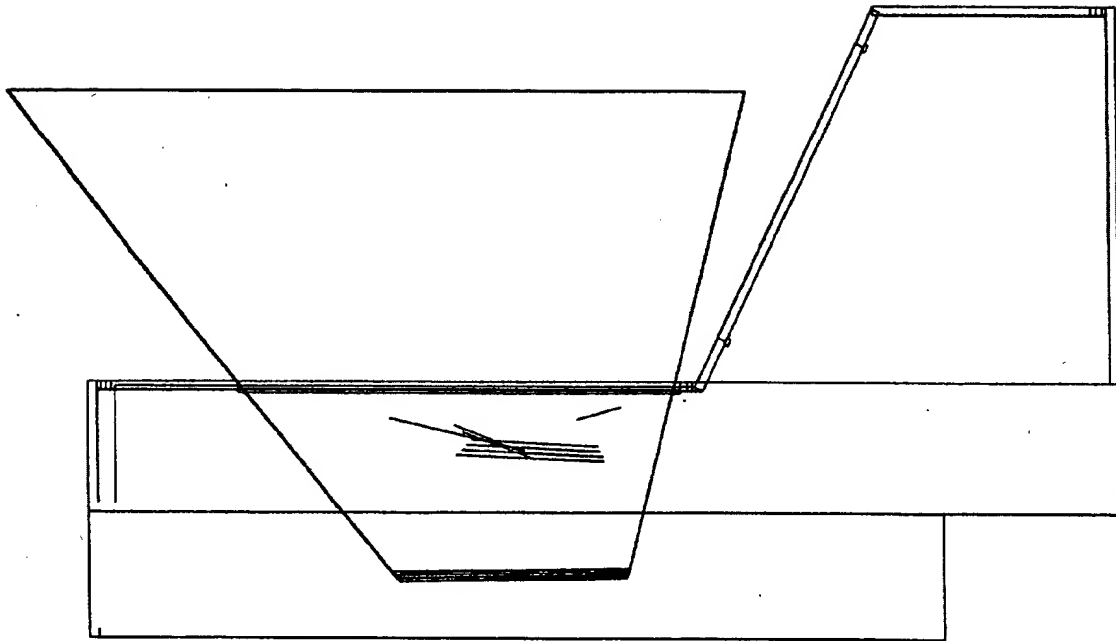


FIG. 504

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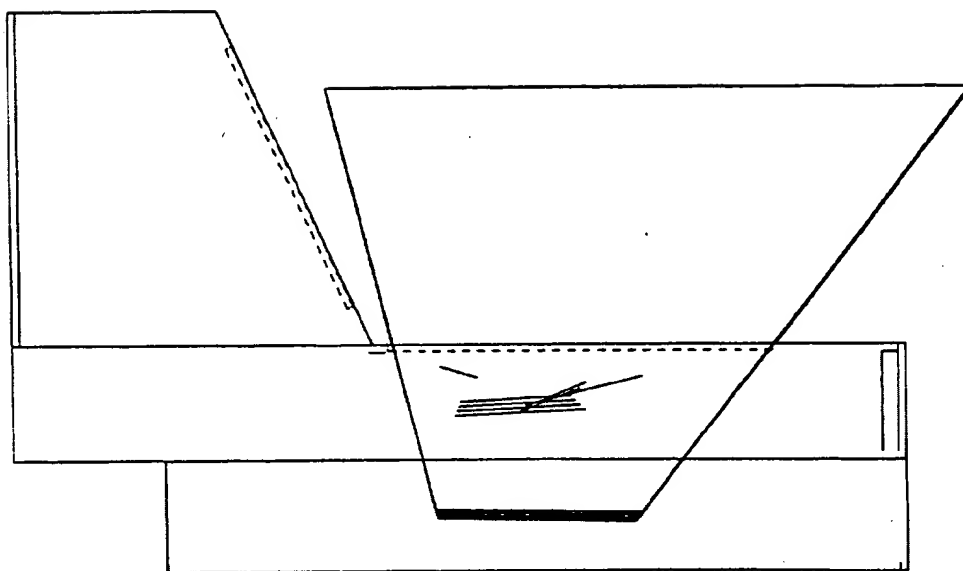


FIG. 505

FIG. 505

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01037525-014304

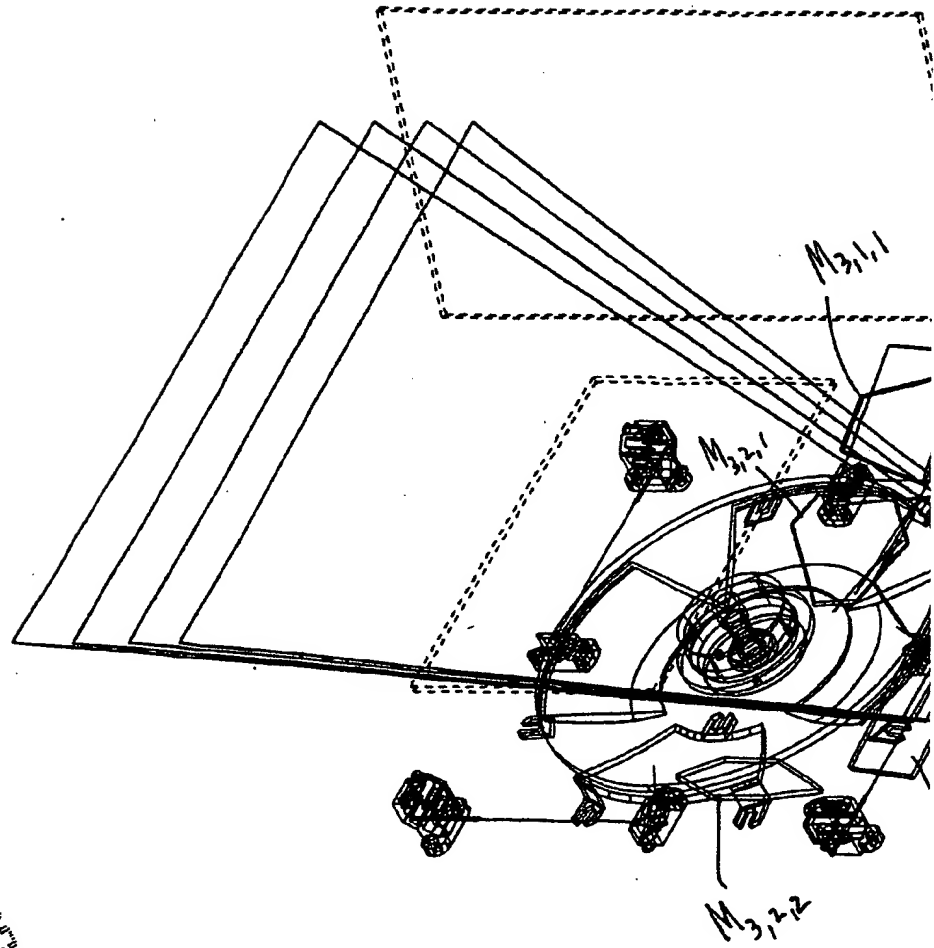


FIG. 5A

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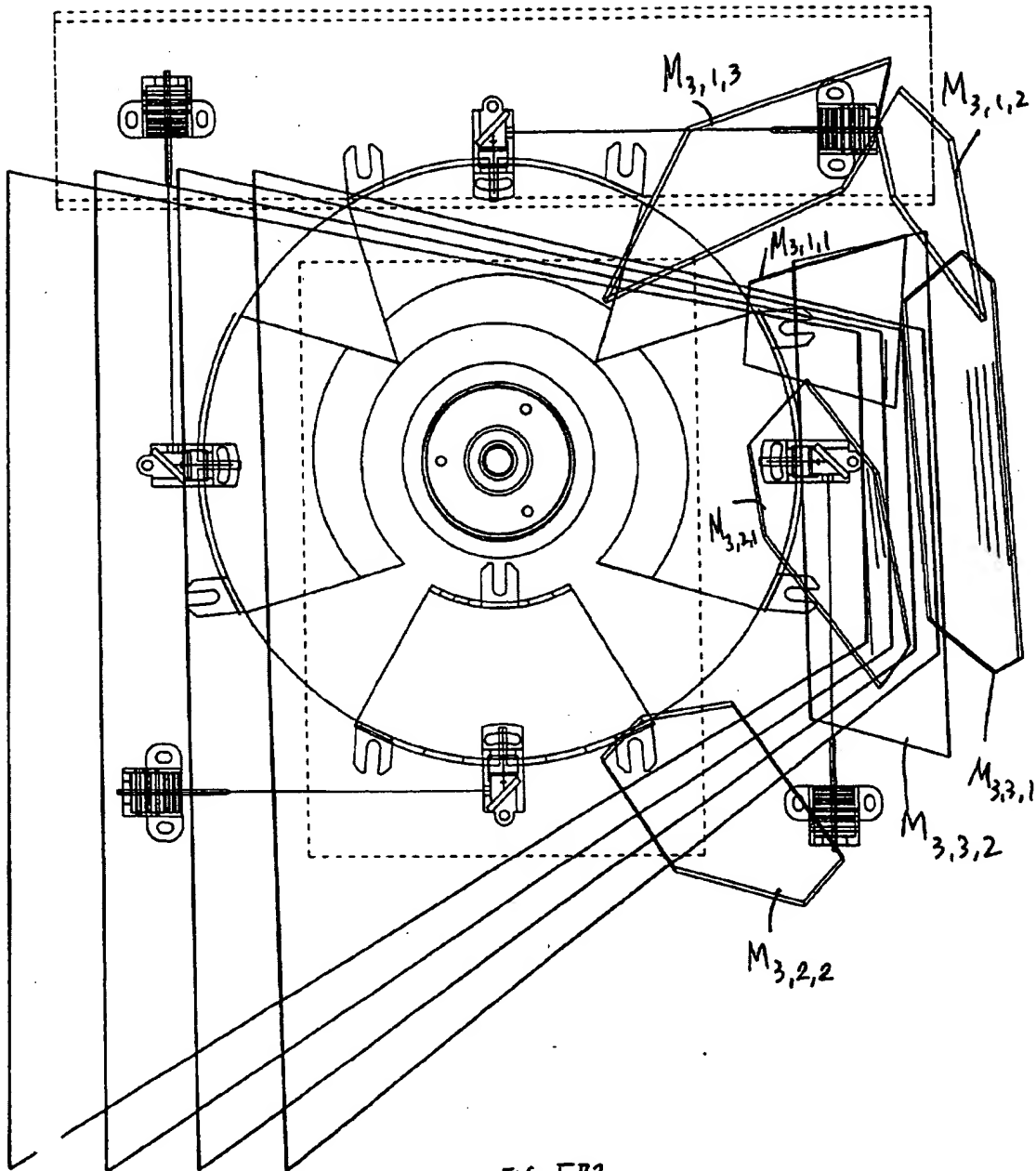


FIG. 5P2

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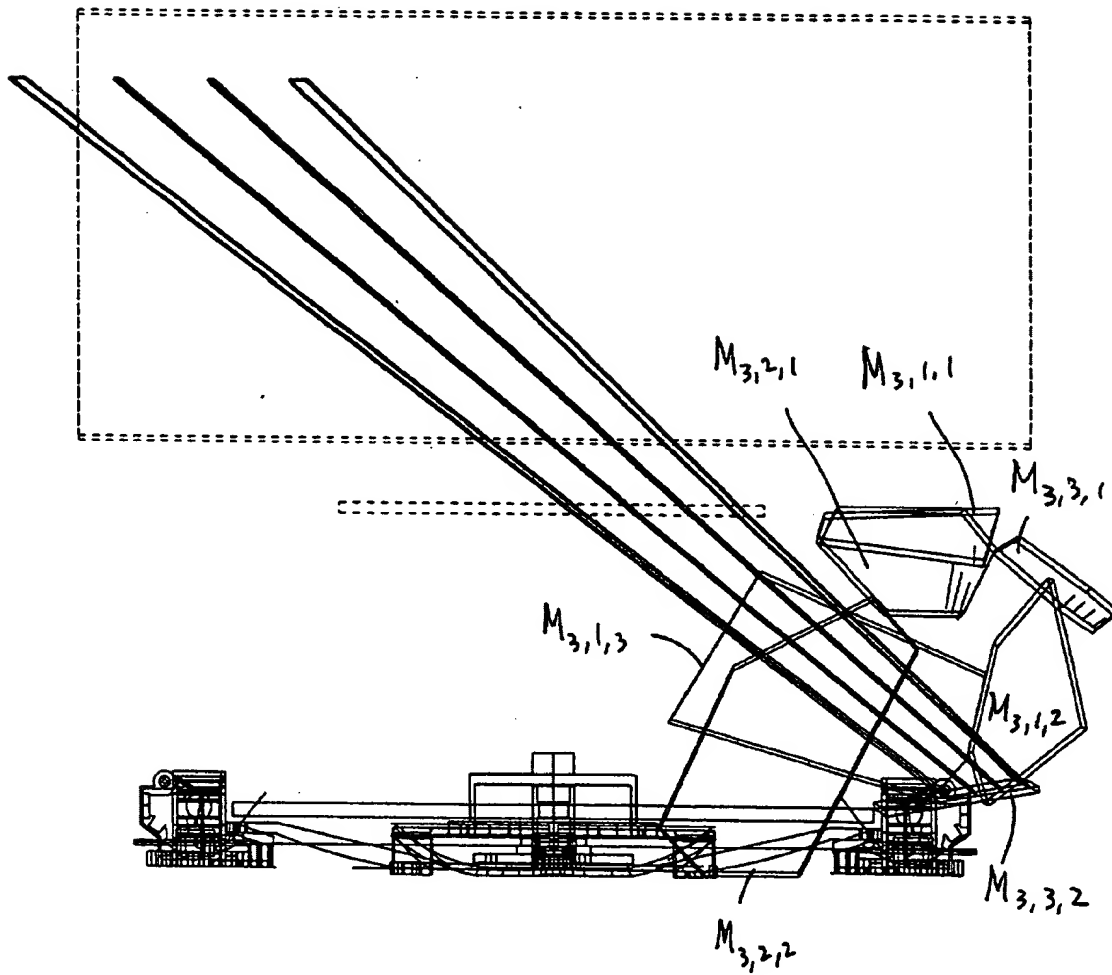


FIG. 5P3

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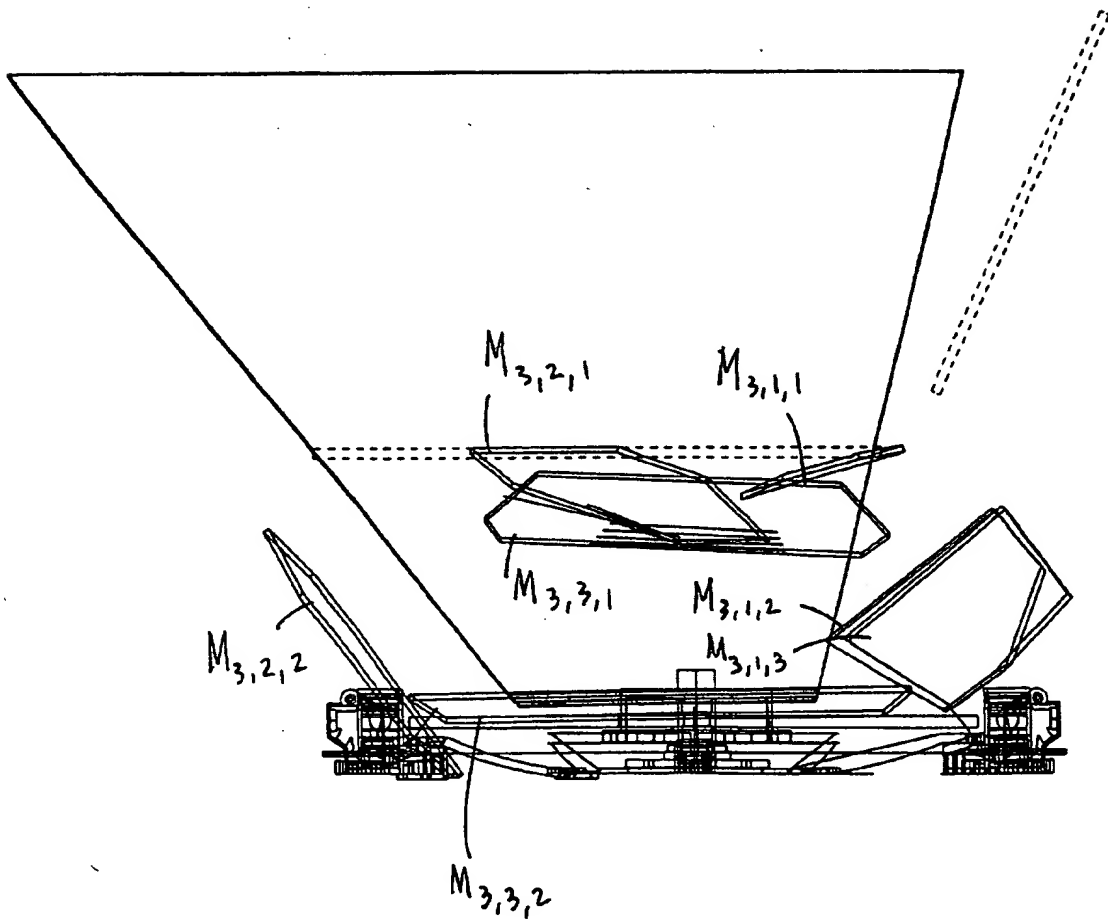


FIG. 584

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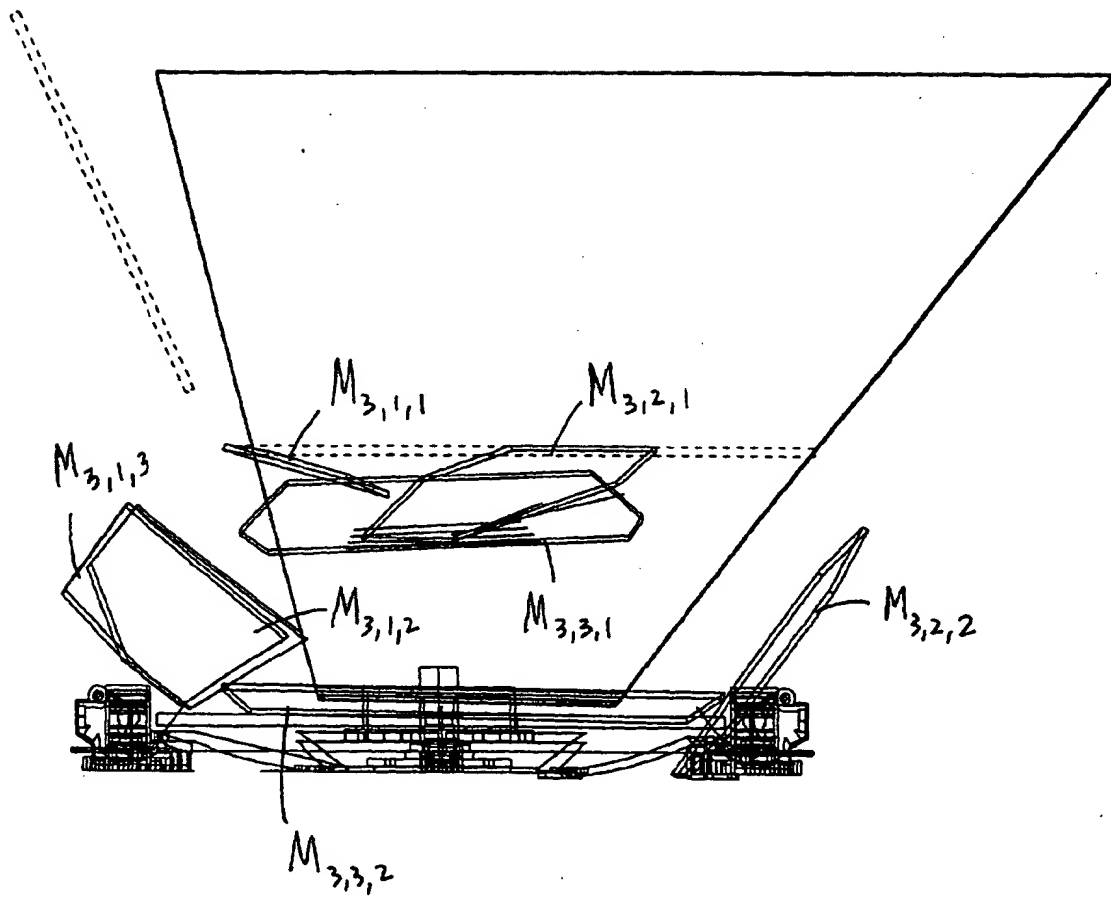


FIG. 5P5

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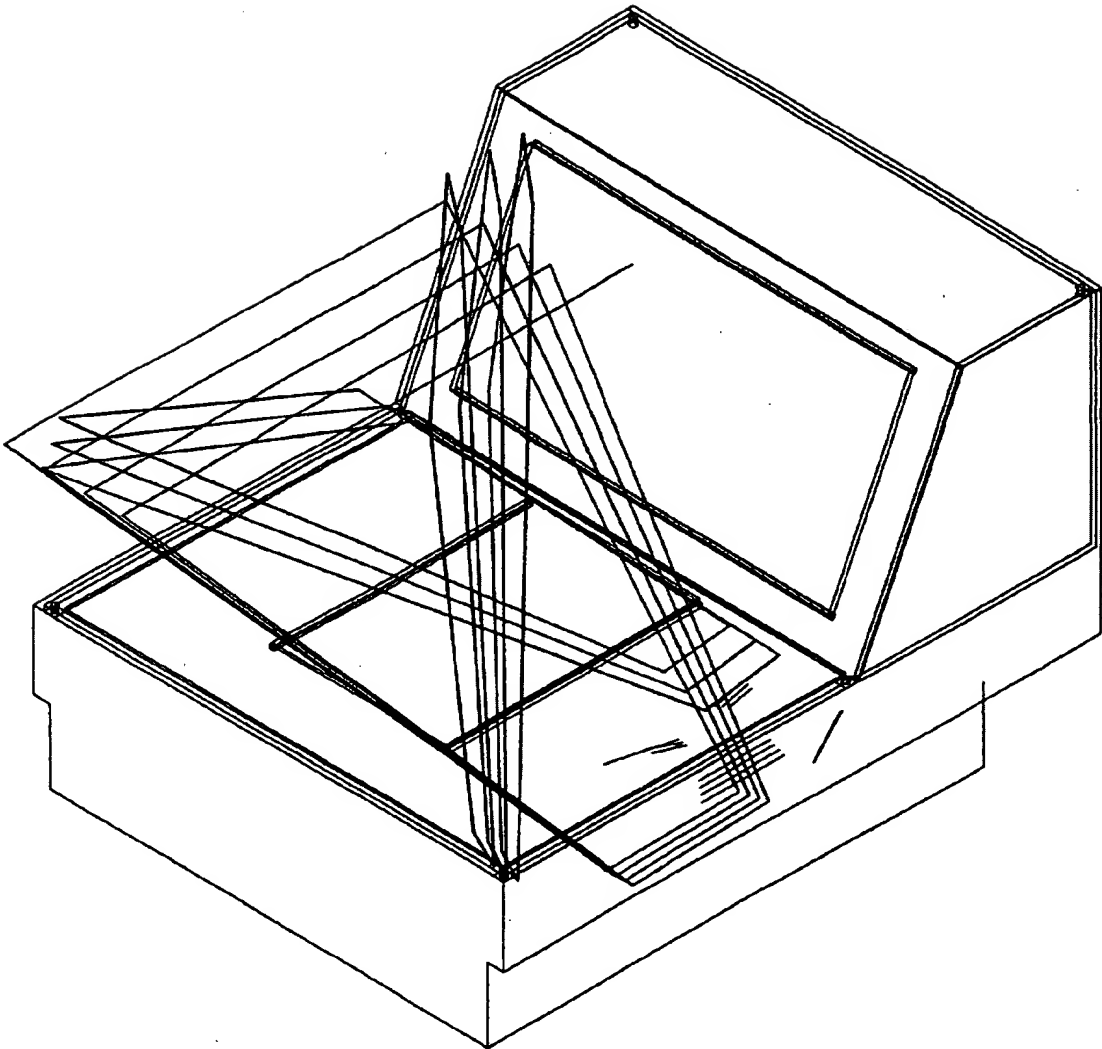


FIG. 5Q1

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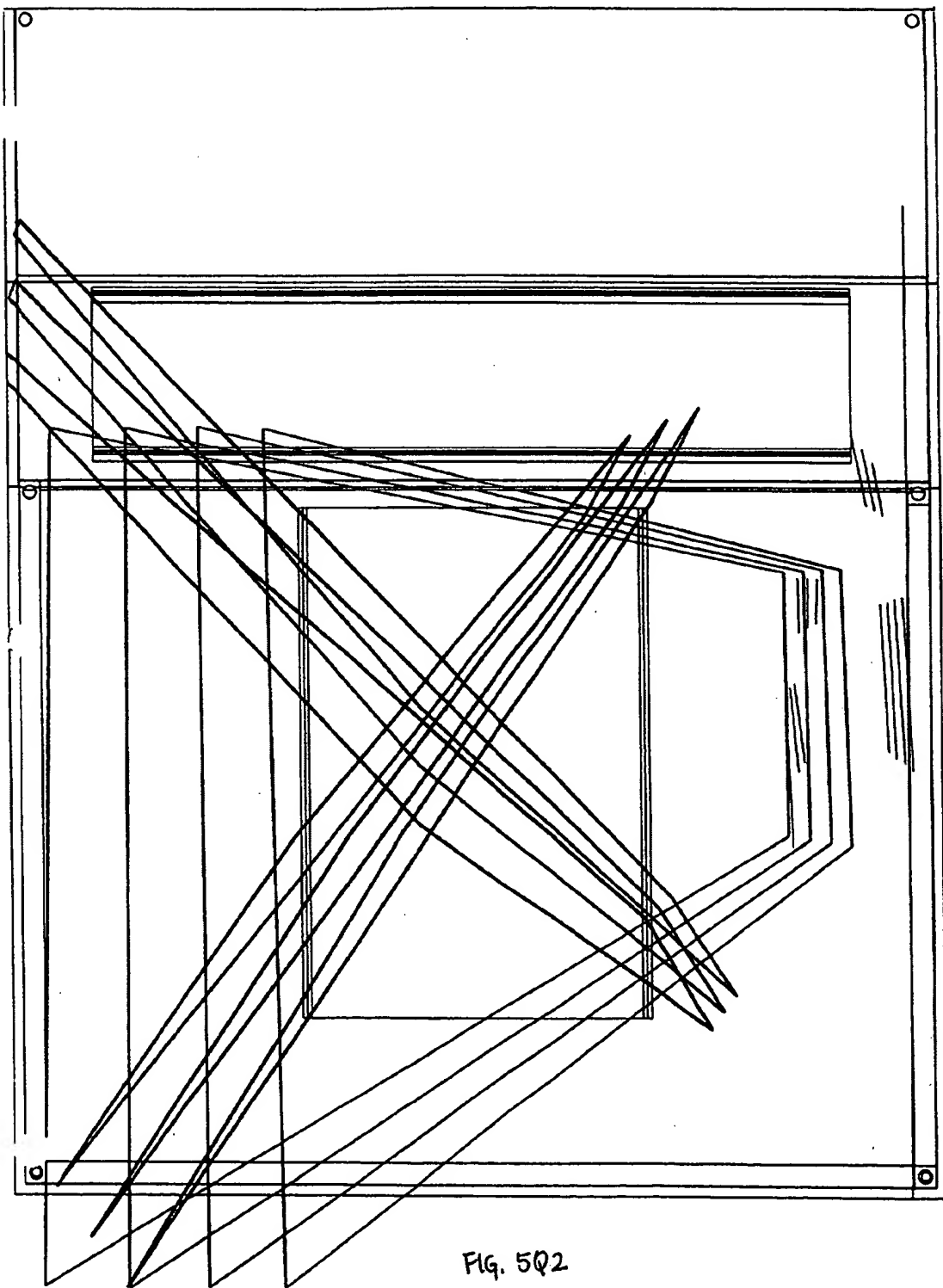


FIG. 5Q2

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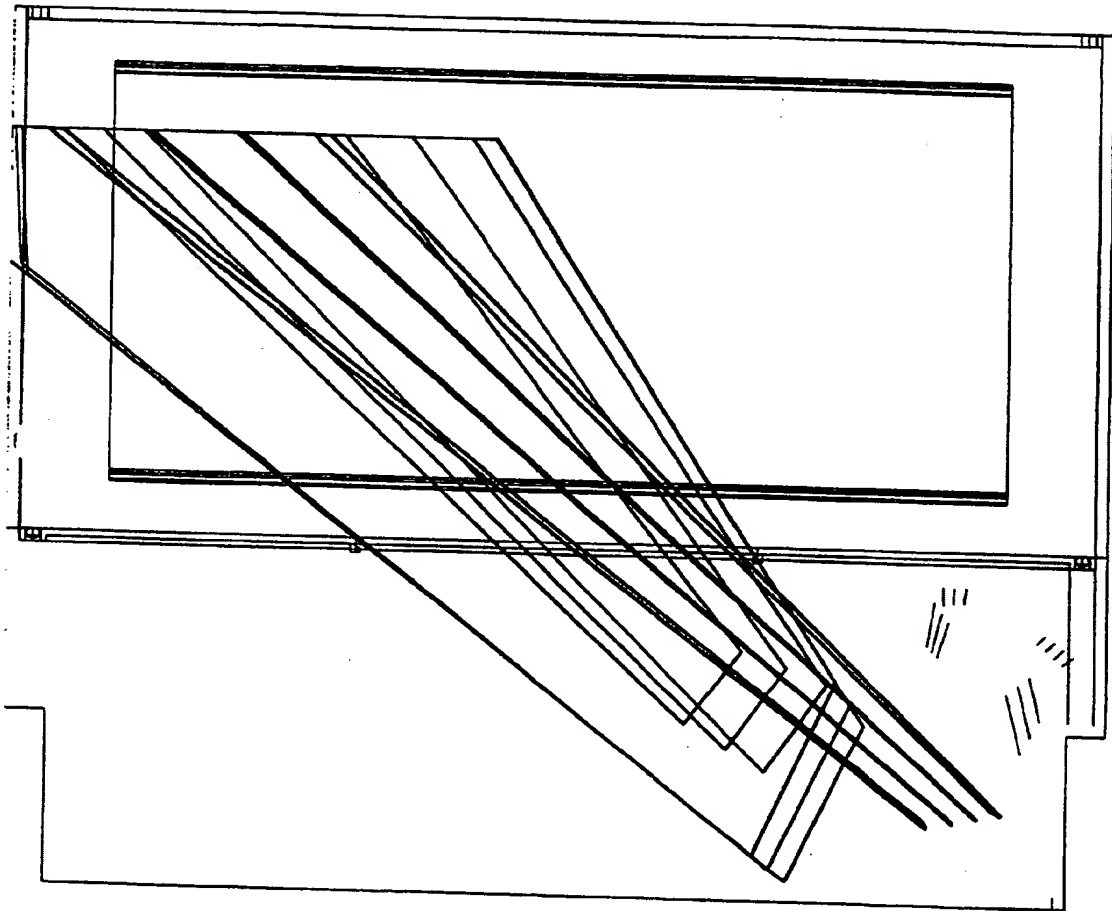


FIG. 5Q3

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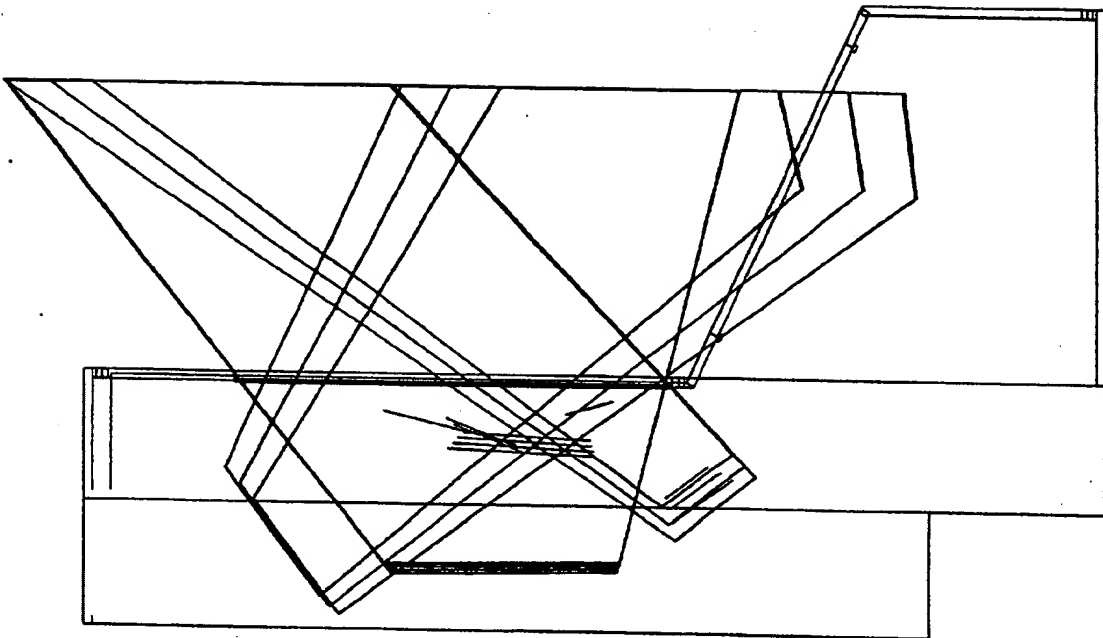


FIG. 5Q4

149/335

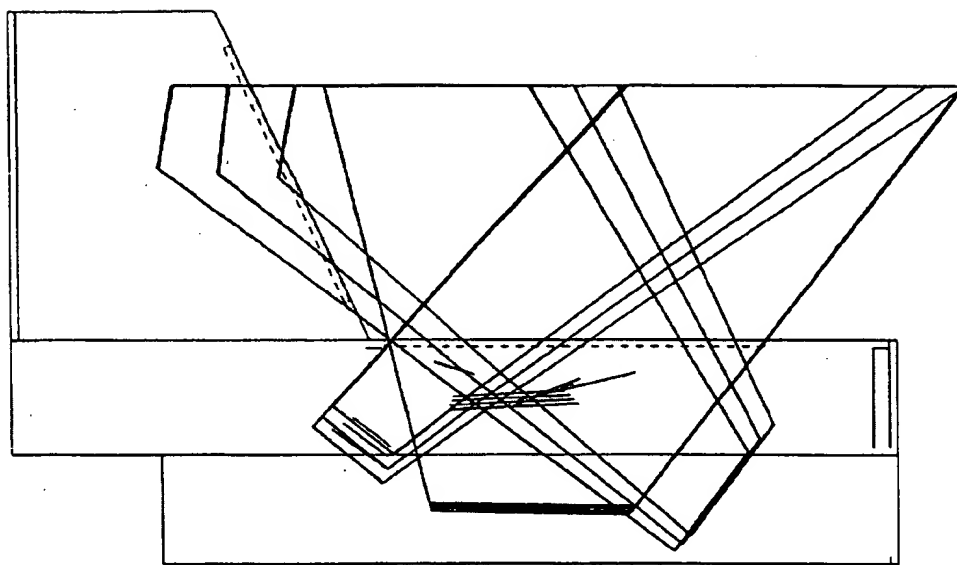


FIG. 5Q5

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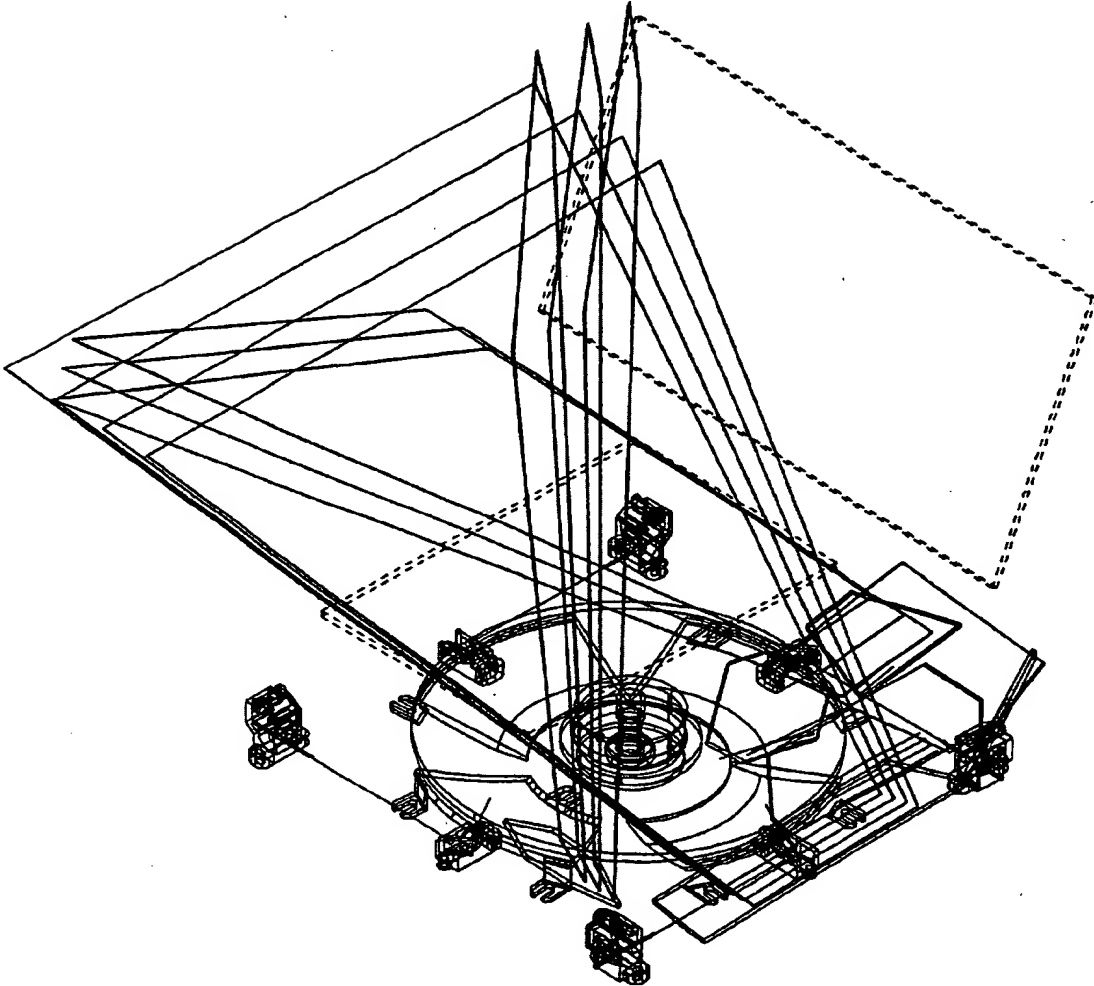


FIG. 5R1

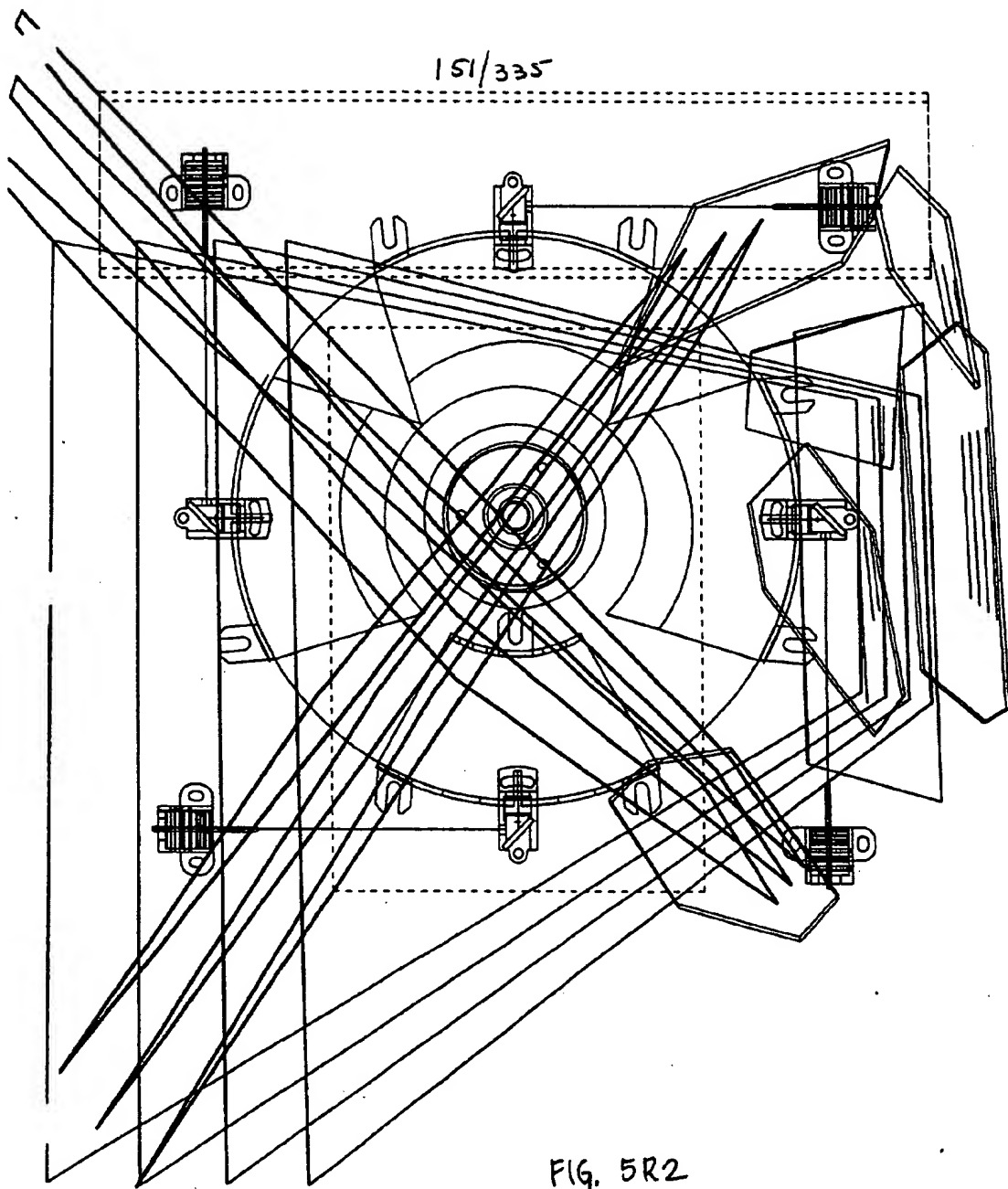


FIG. 5R2

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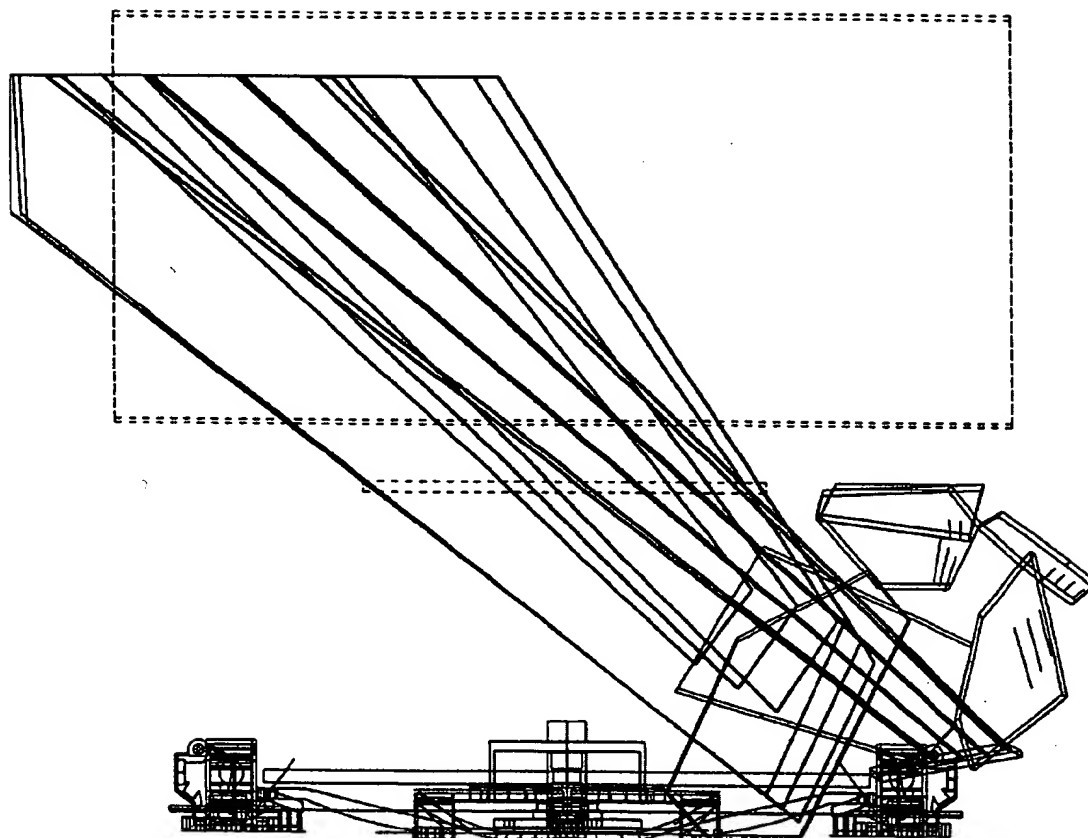


FIG. 5R3

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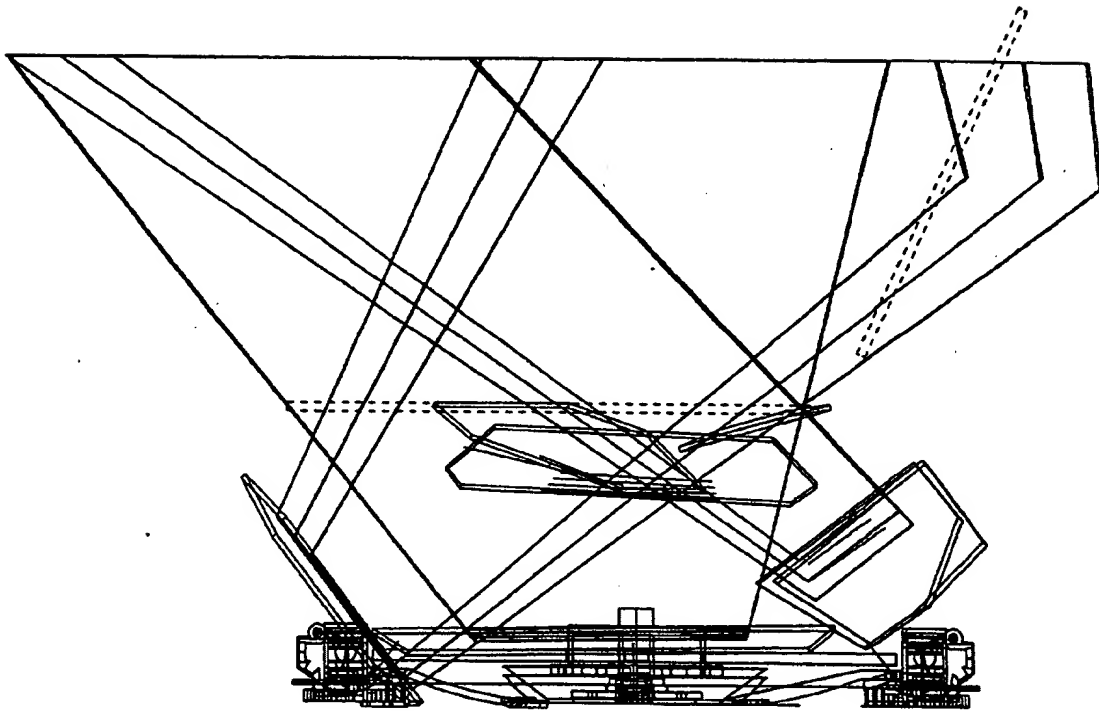


FIG. 5R4

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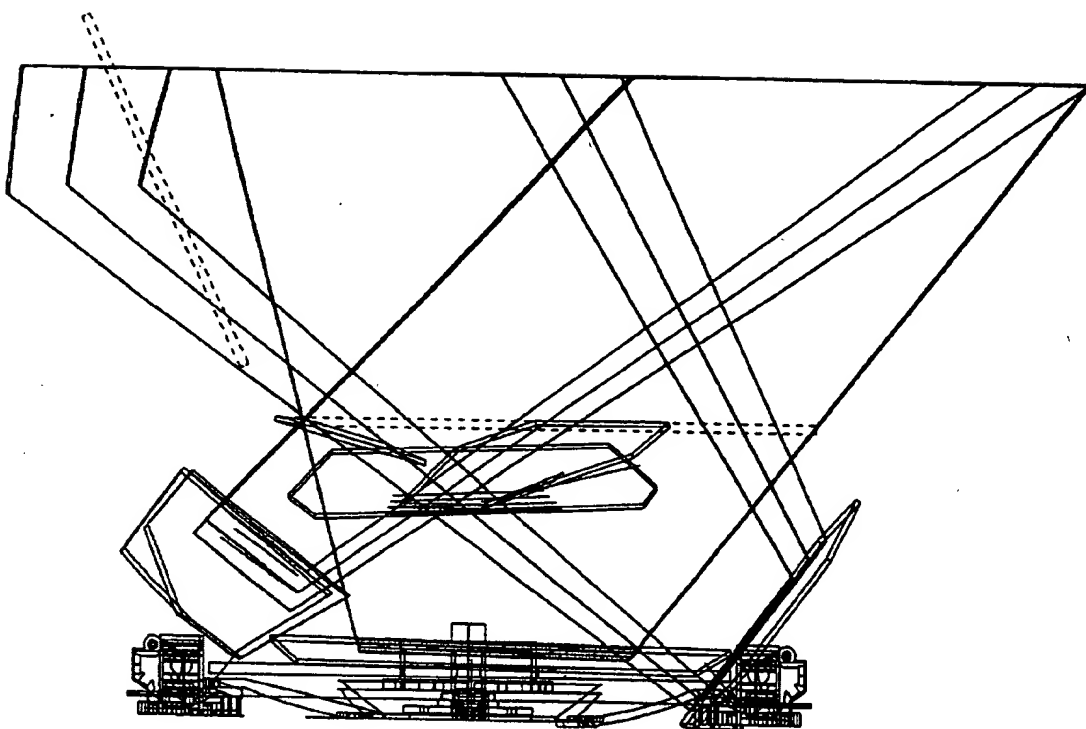


FIG. 5R5

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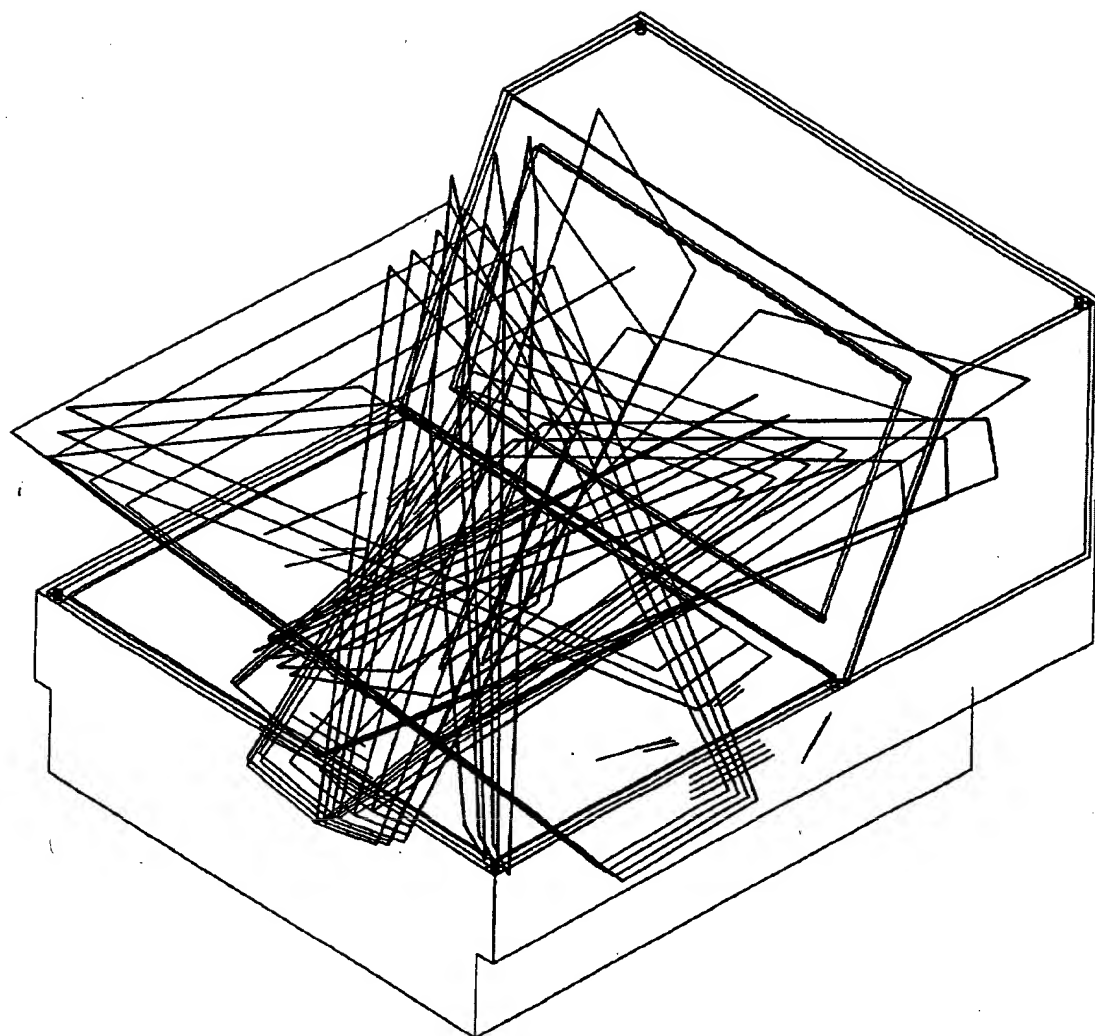


FIG. 581

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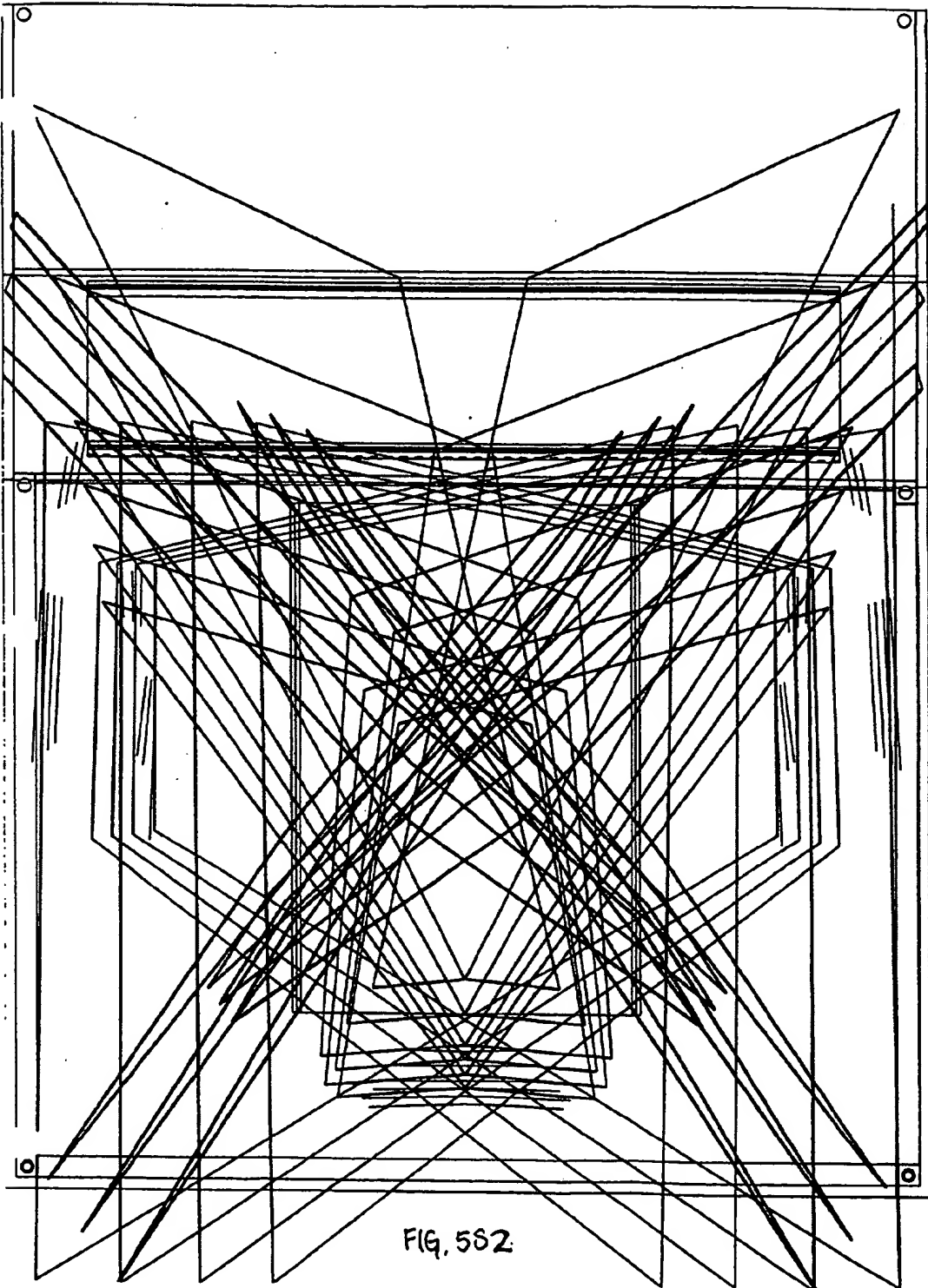


FIG. 552

FIG. 552

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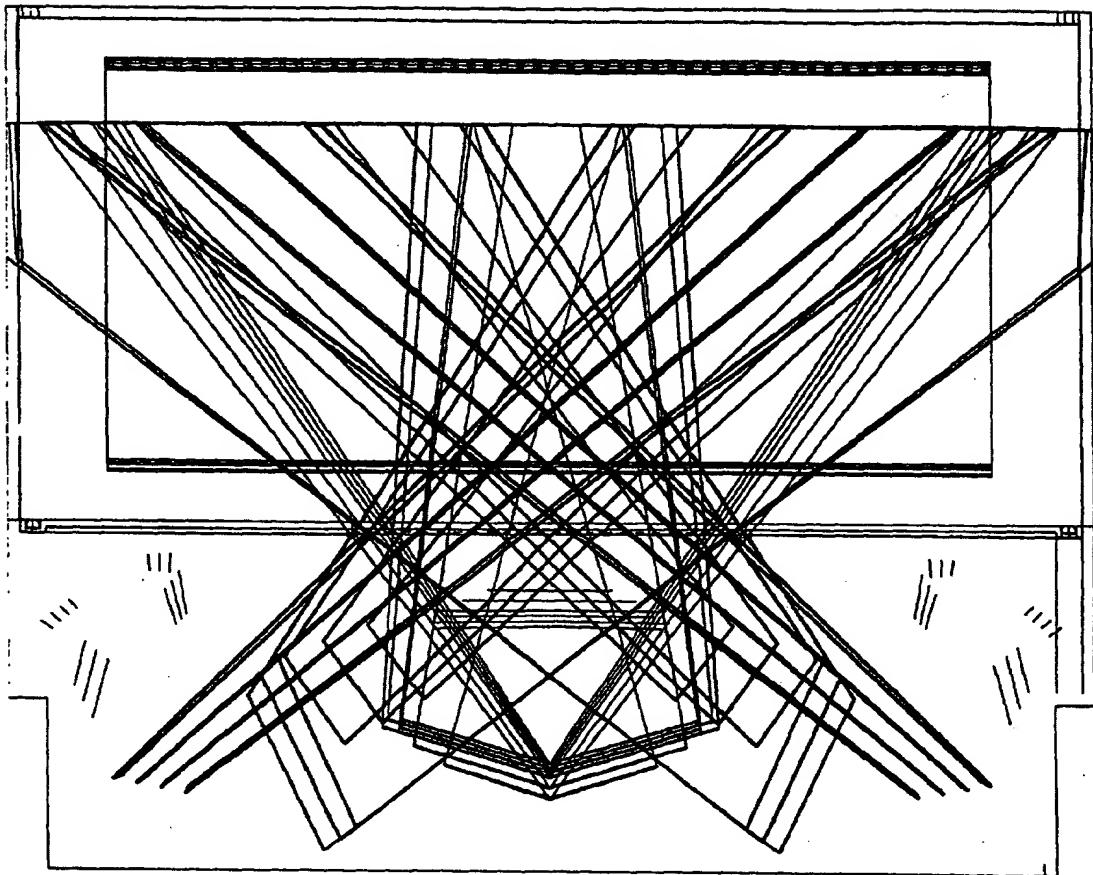


FIG. 553

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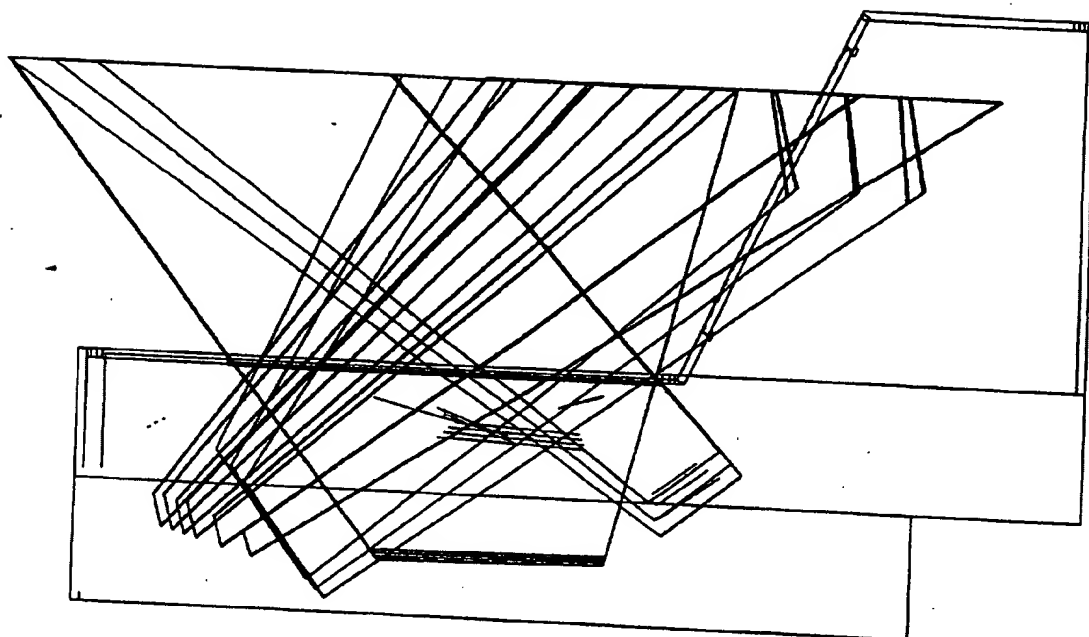


FIG. 584

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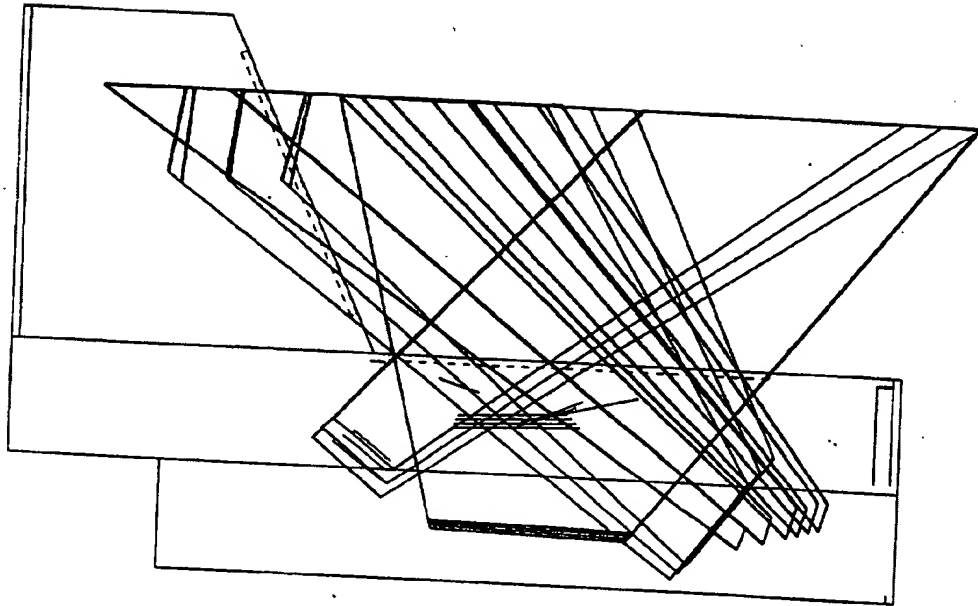


FIG. 555

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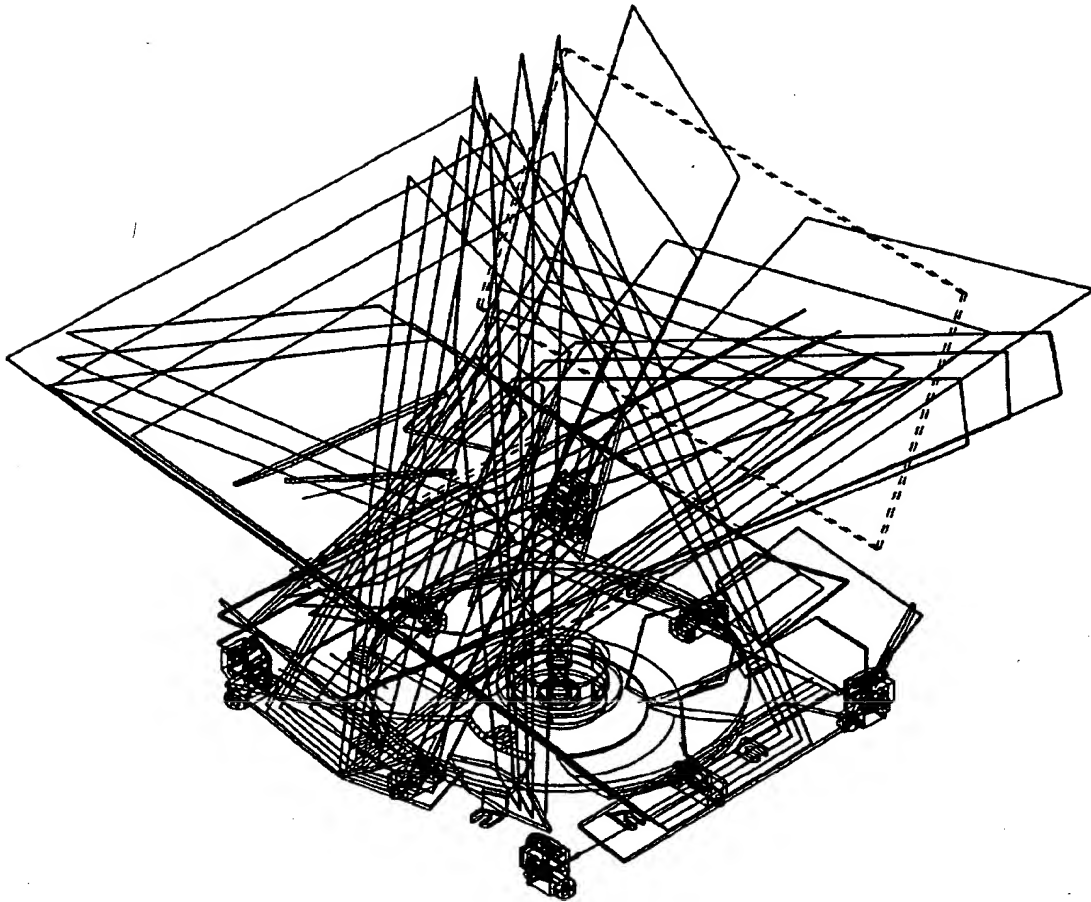


FIG. 5T1

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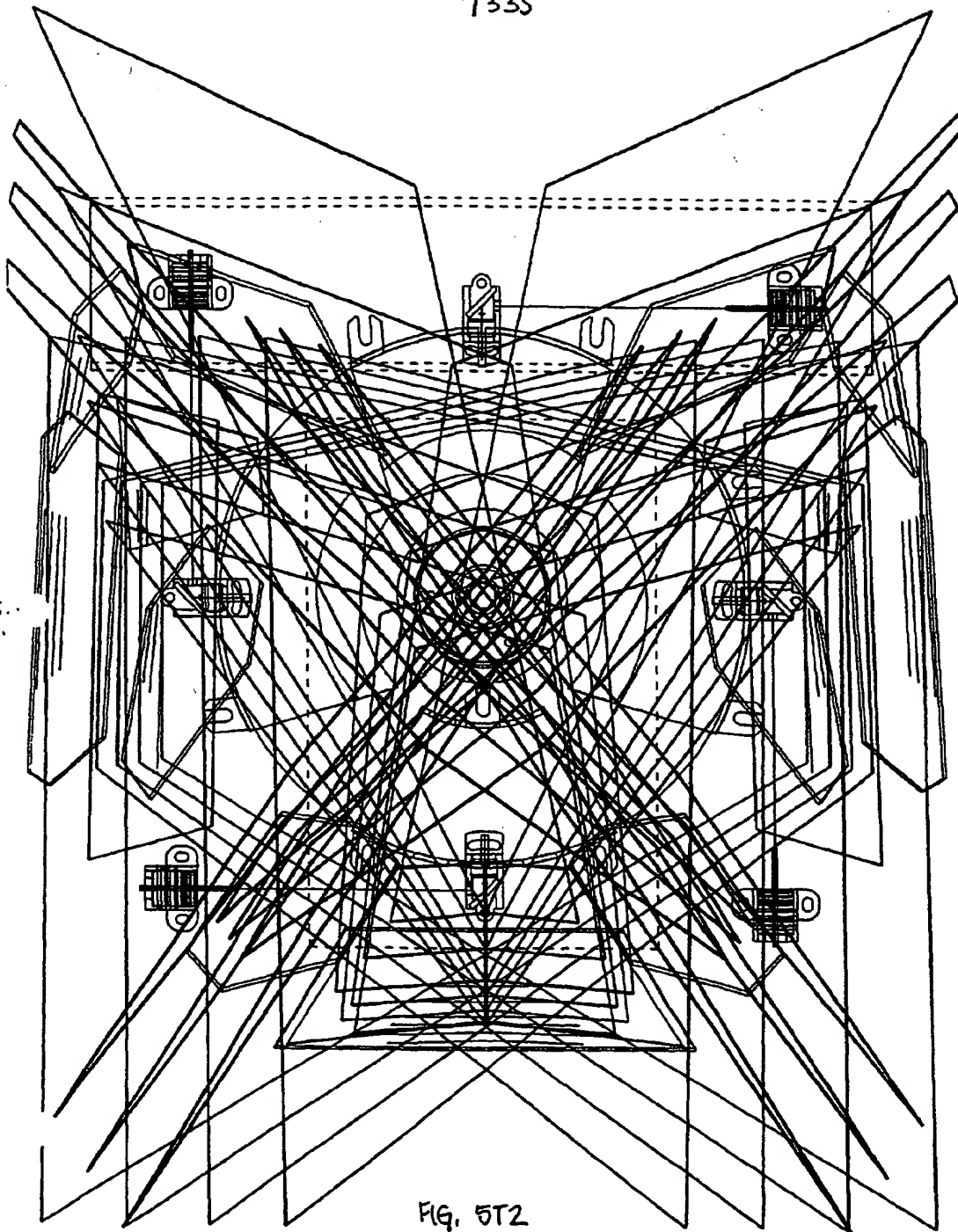


FIG. 5T2

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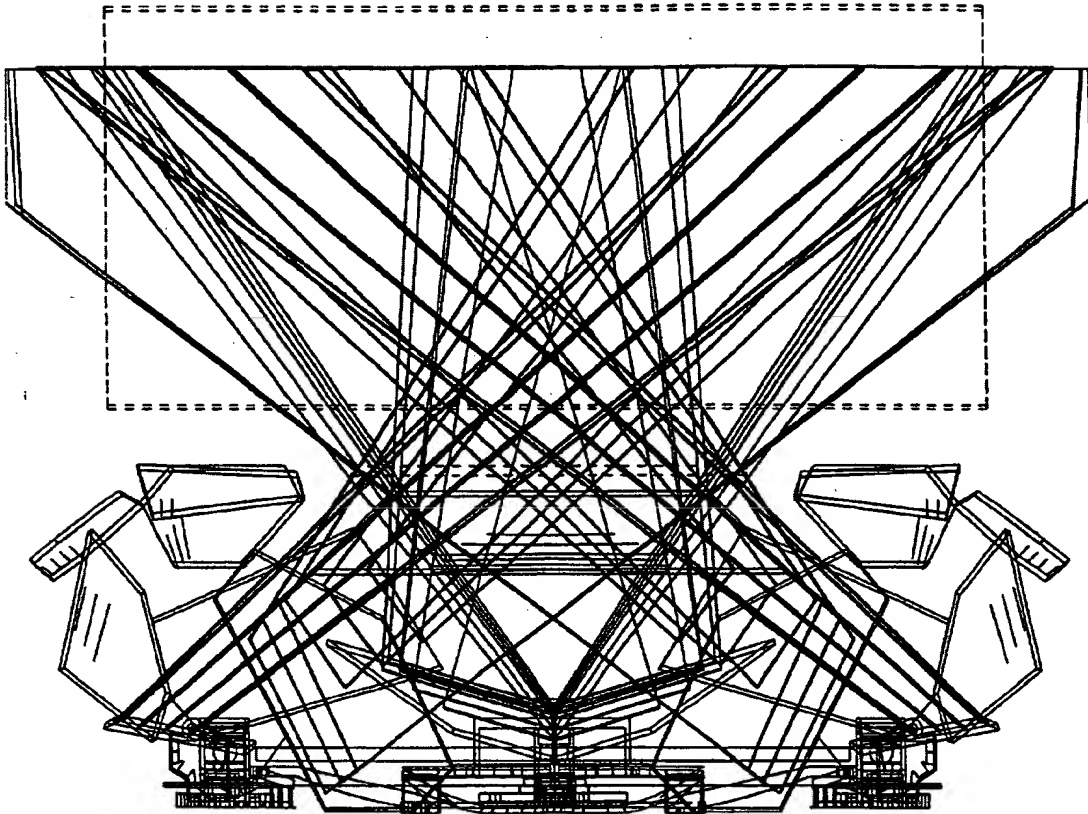


FIG. 5T3

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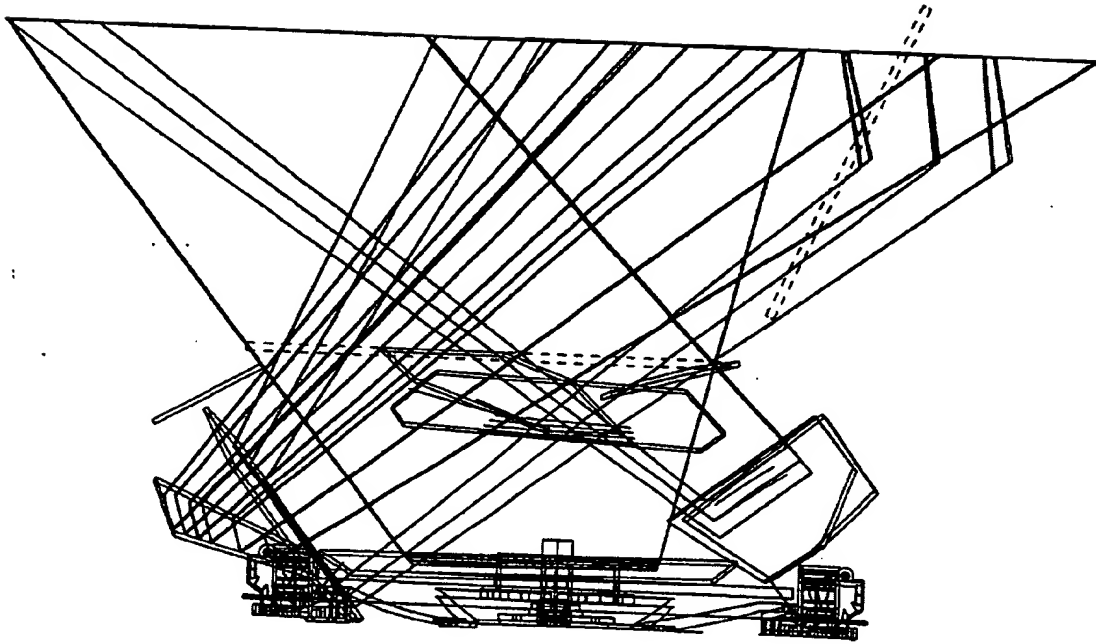


FIG. 5T4

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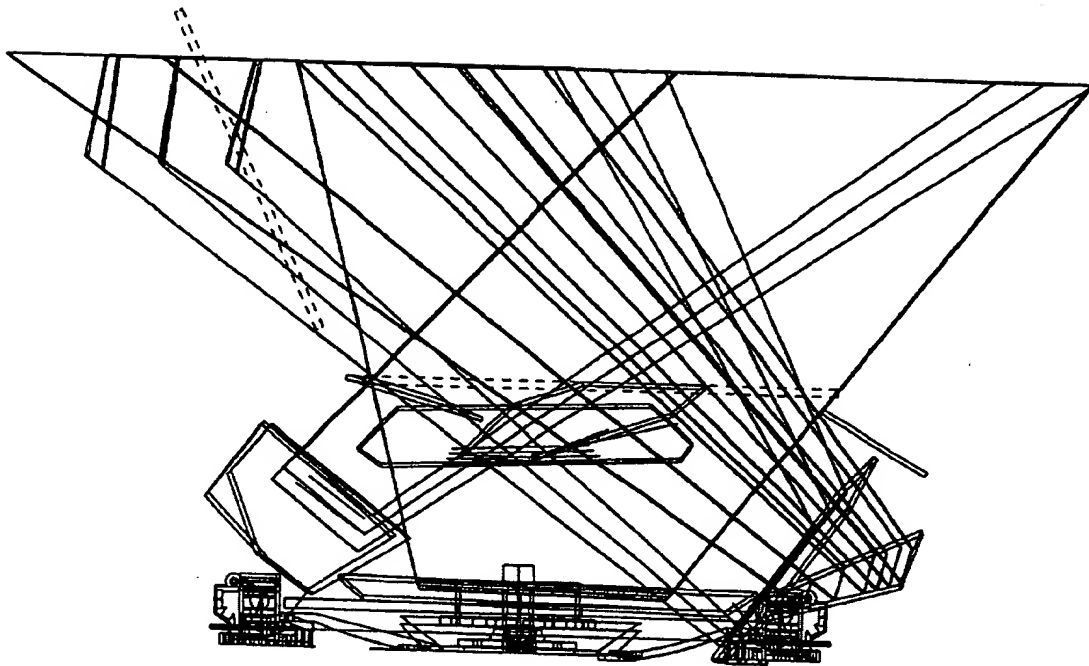


FIG. 5T5

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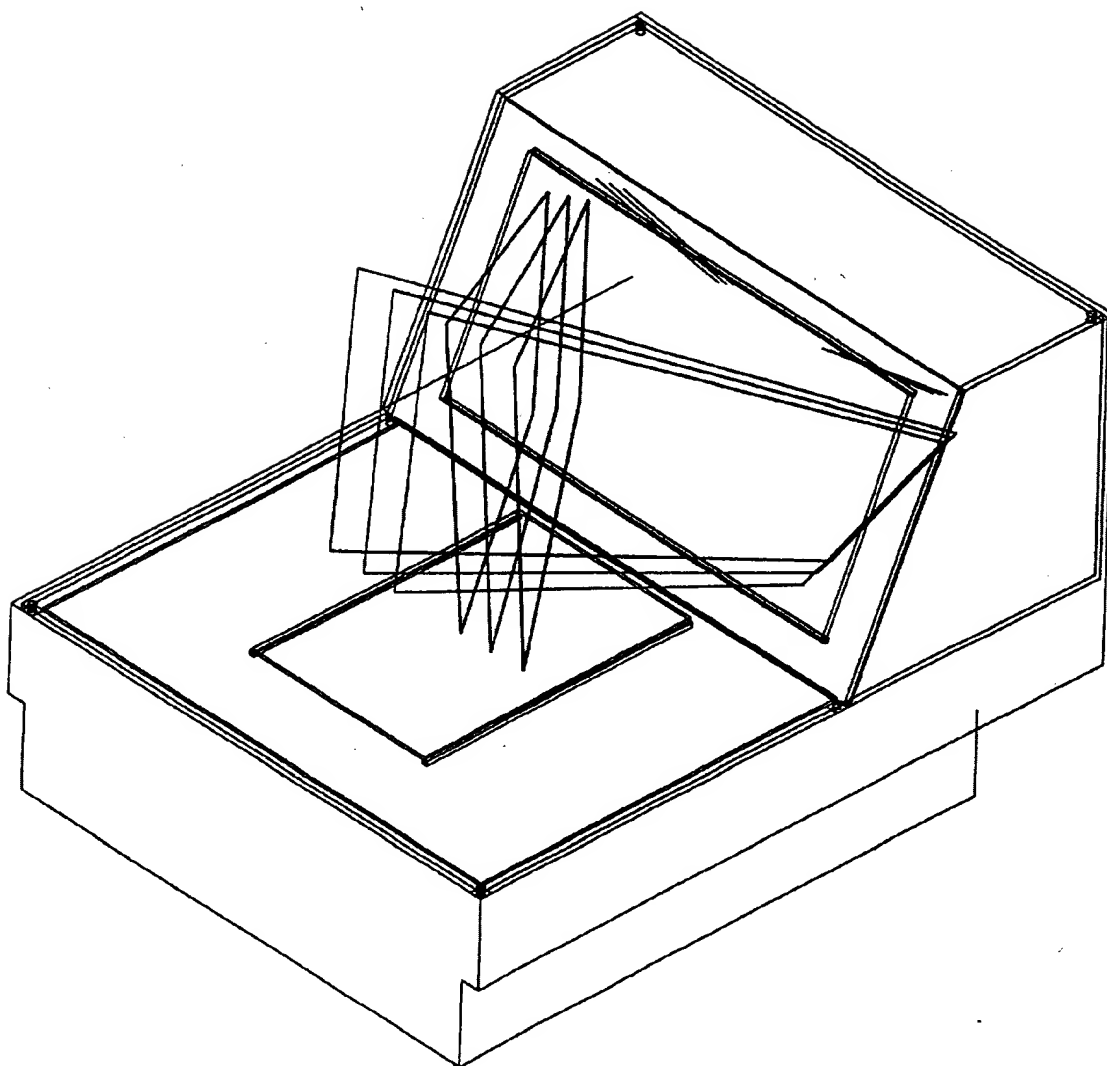


FIG. 5U1

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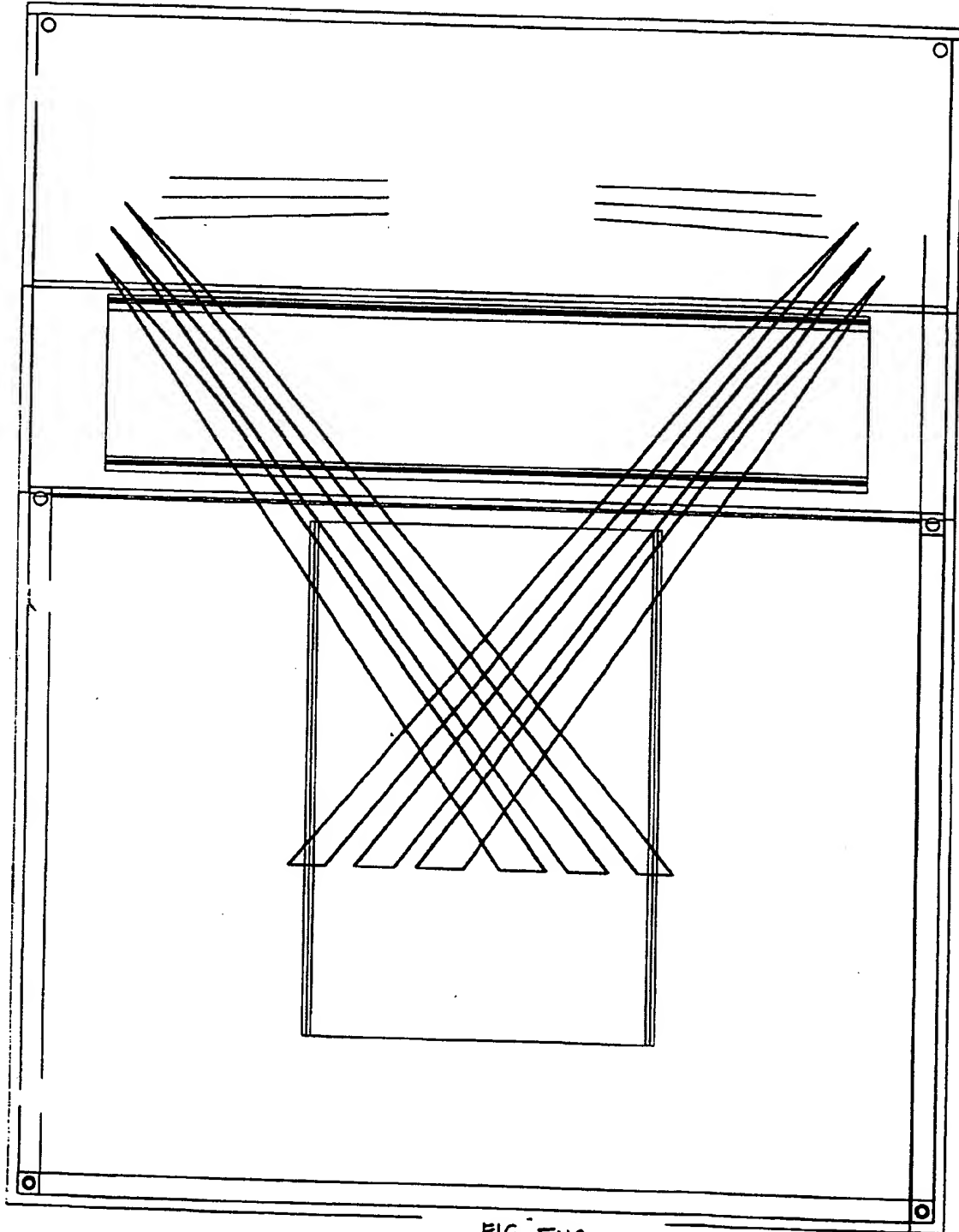


FIG. 502

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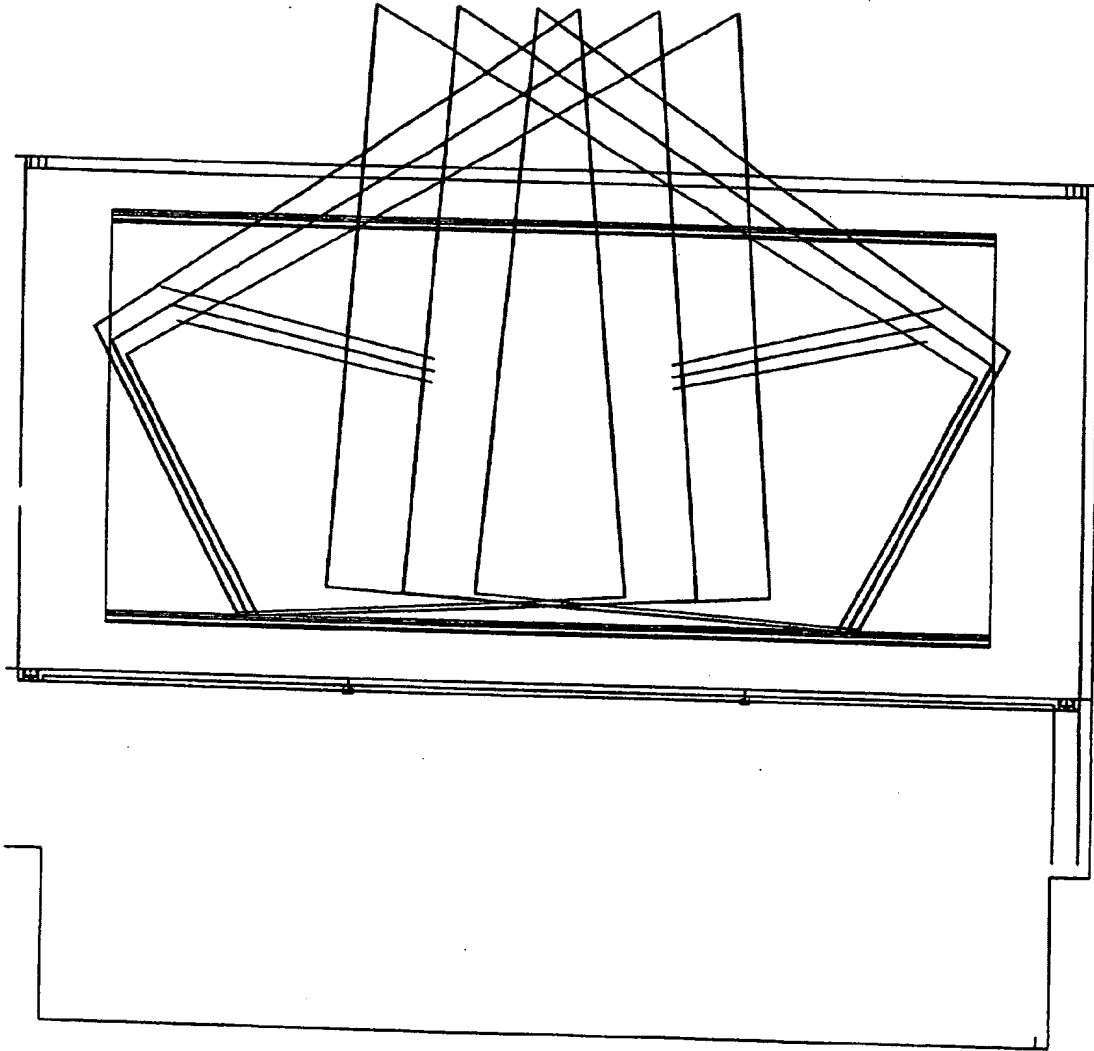


FIG. 5V3

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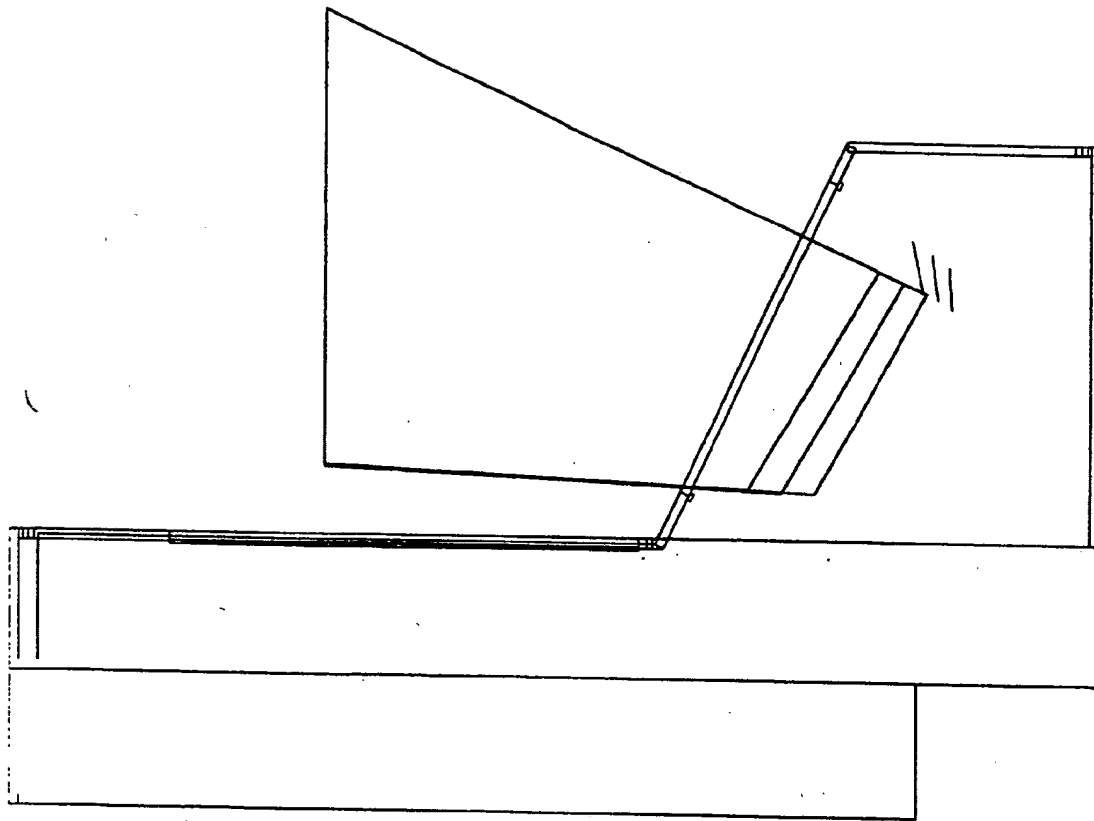


FIG. 504

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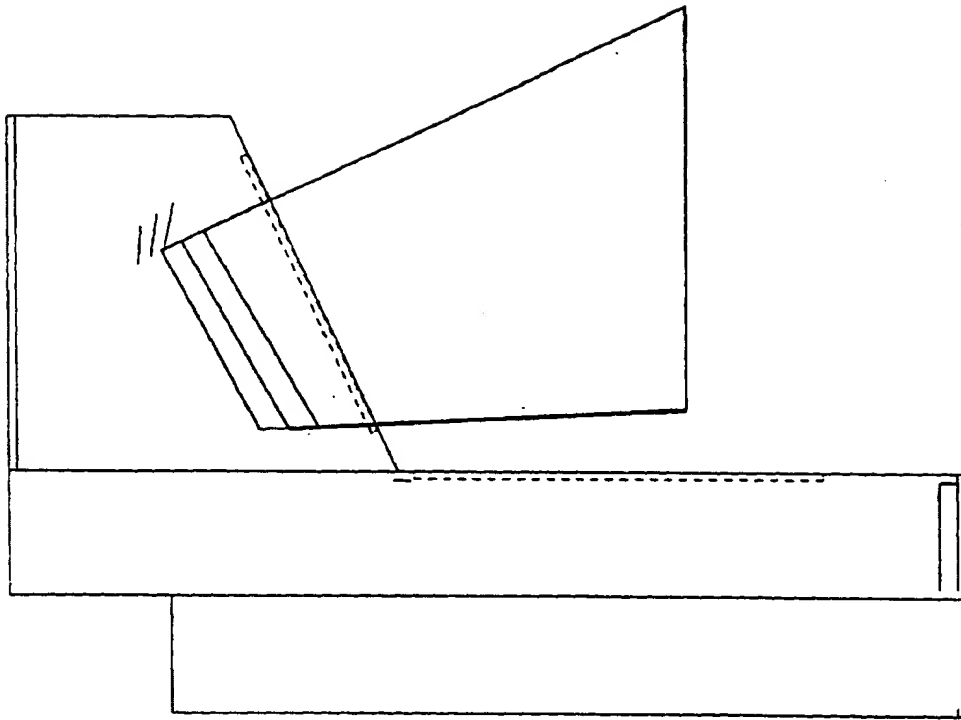


FIG. 5U5

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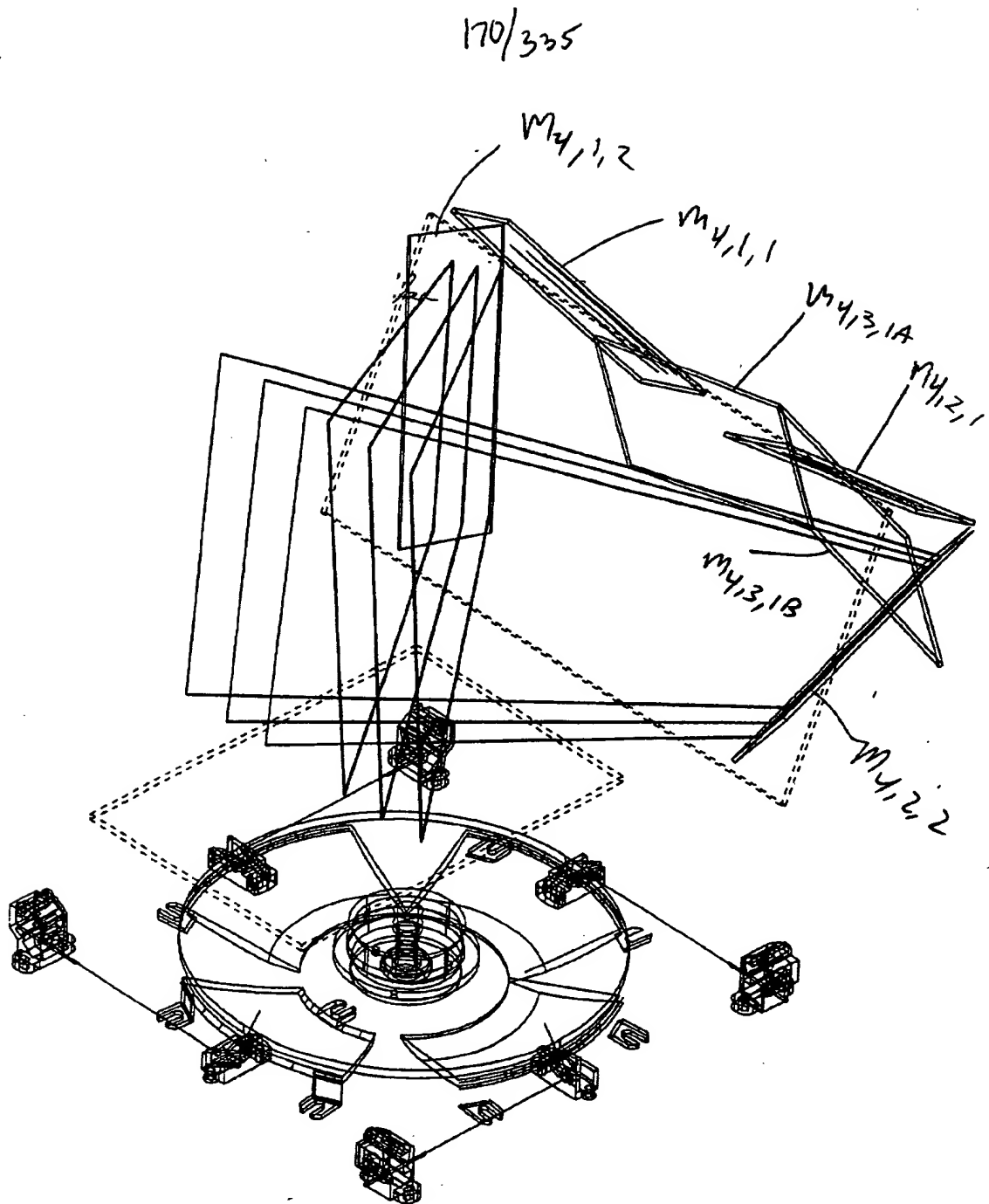


FIG. 5V1

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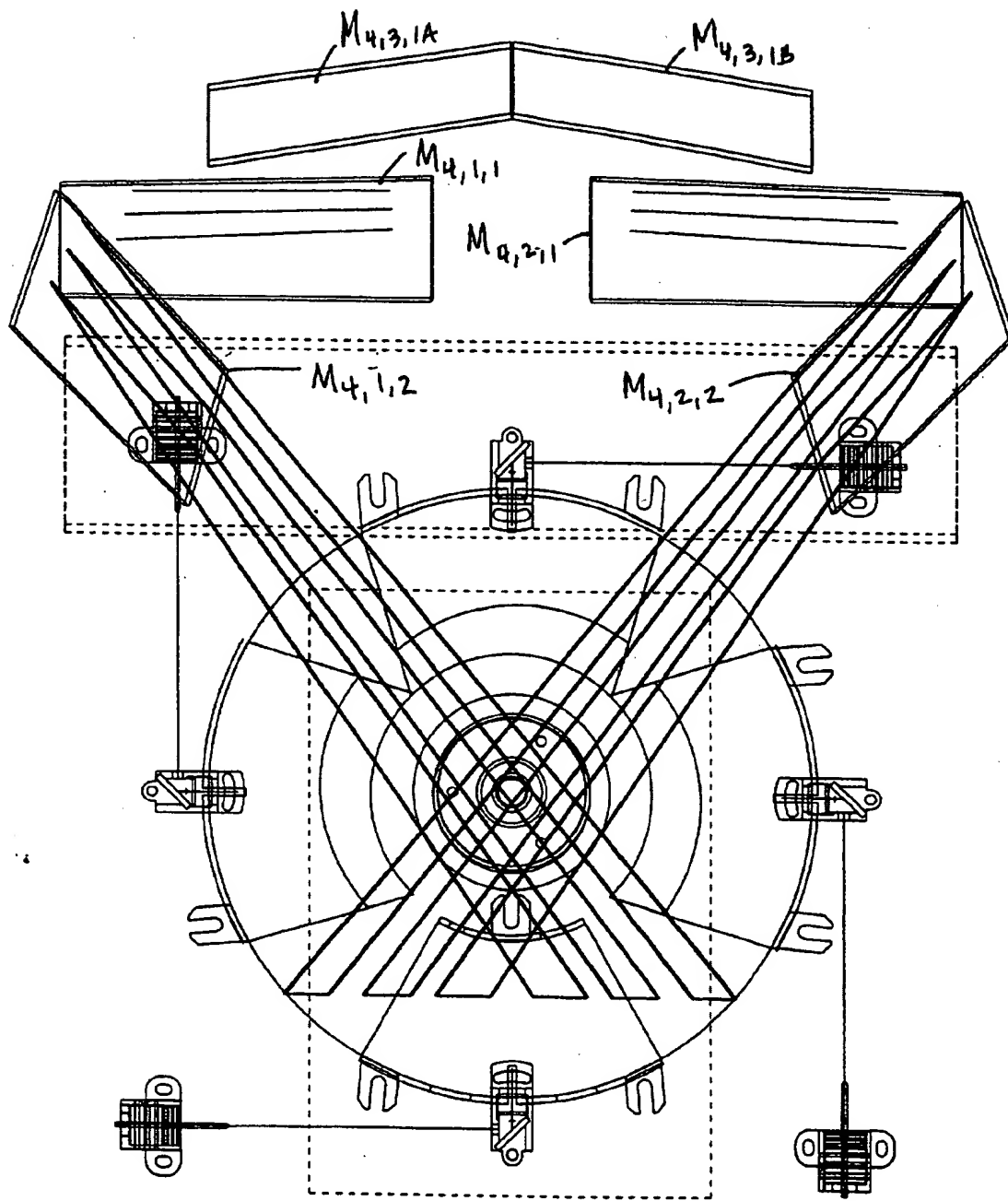


FIG. 5V2

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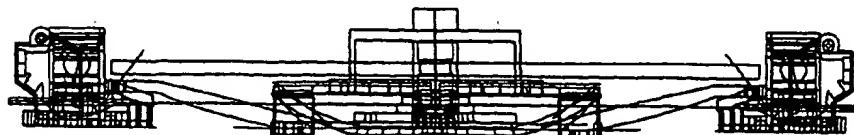
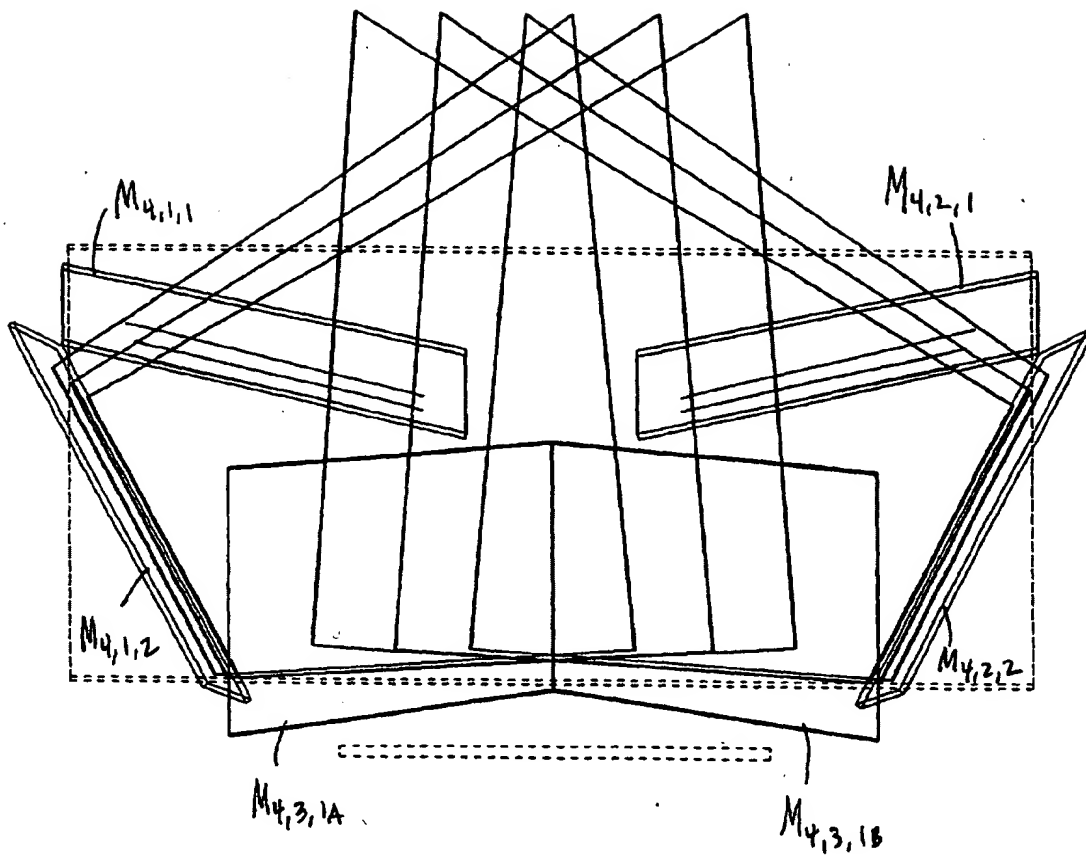


FIG. 5V3

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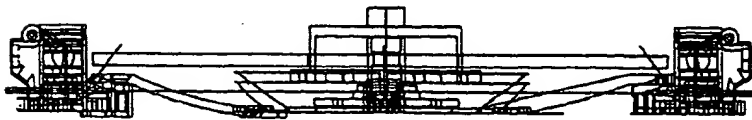
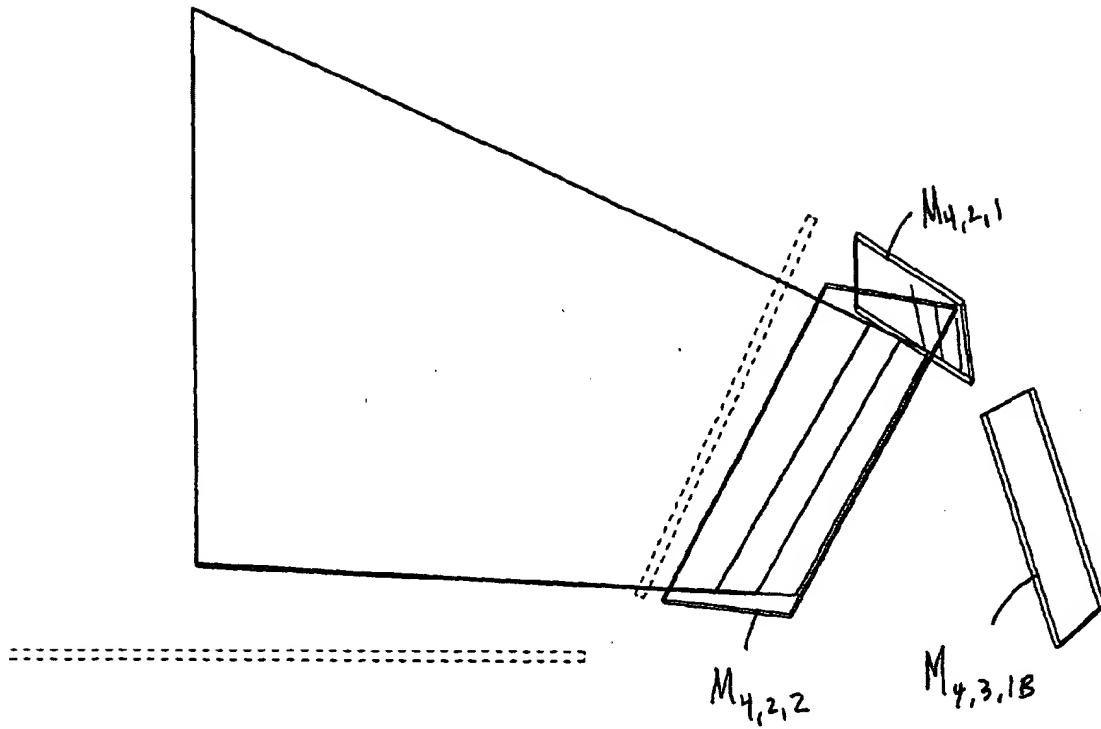


FIG. 5V4

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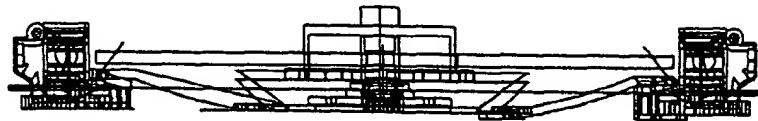
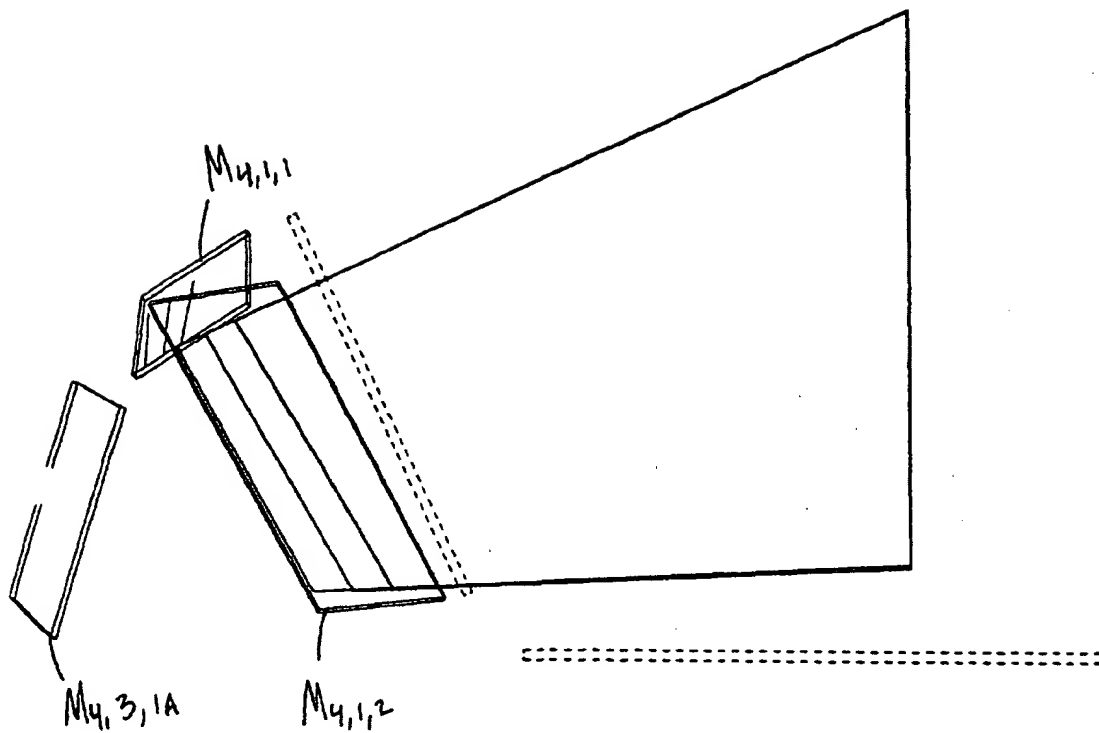


FIG. 5V5

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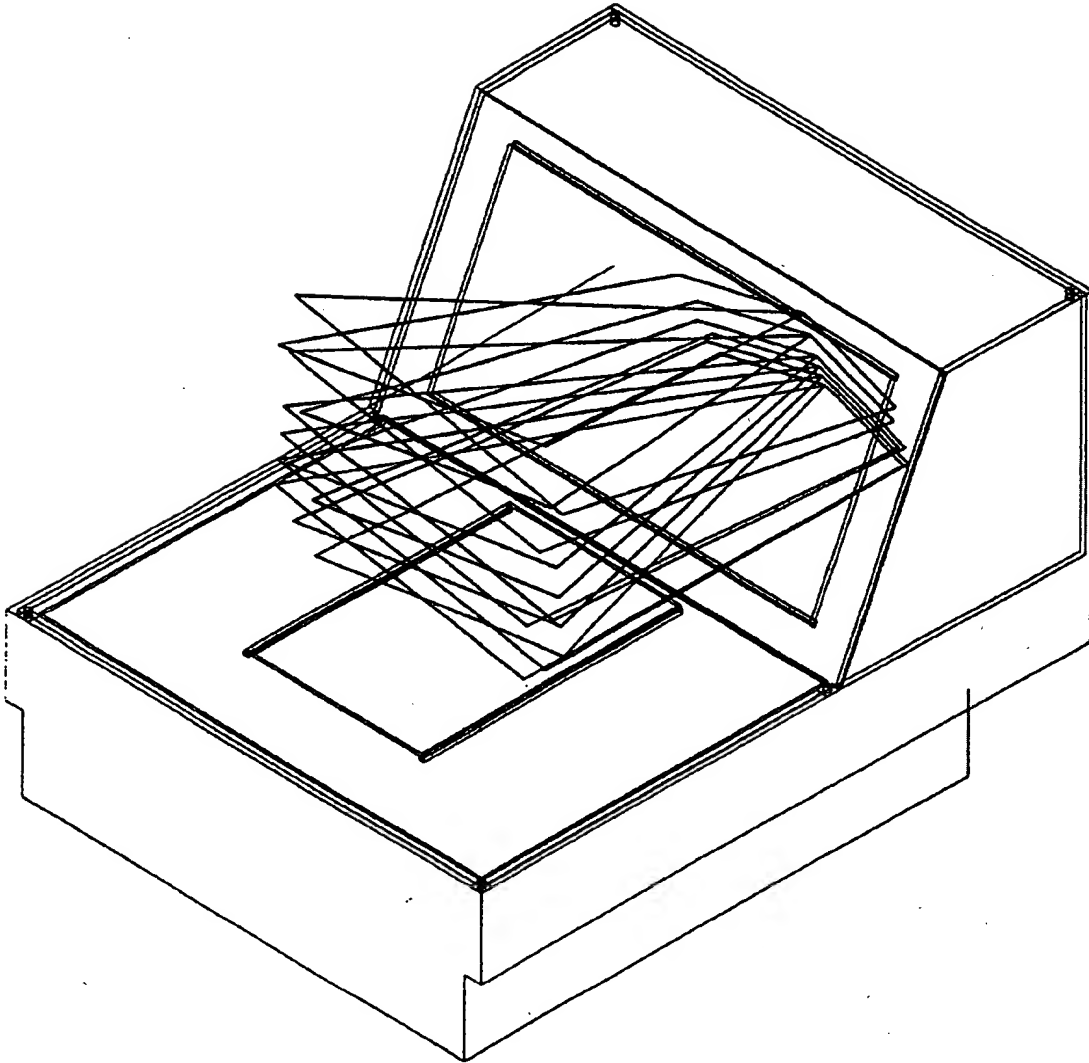


FIG. 5W1

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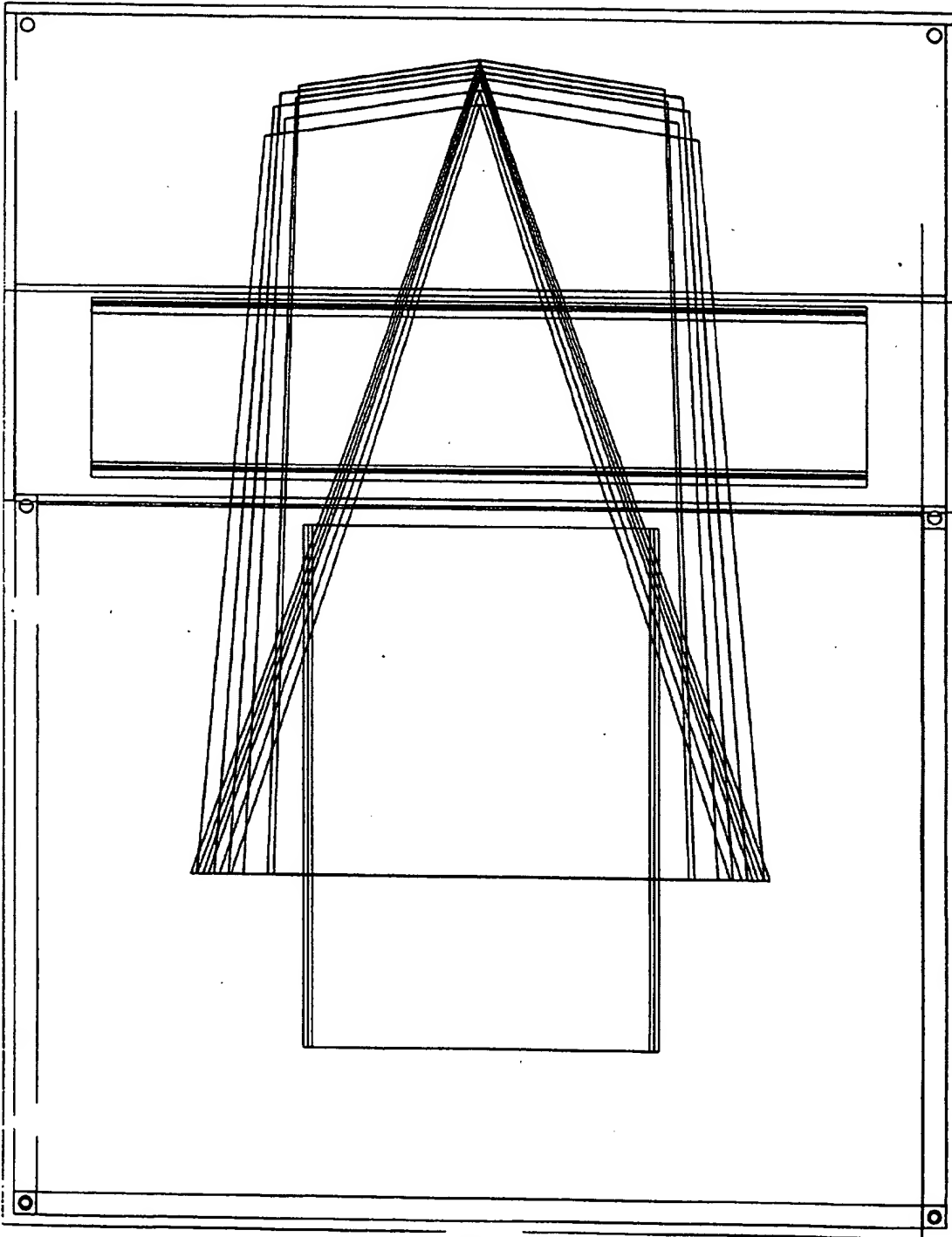


FIG. 5N2

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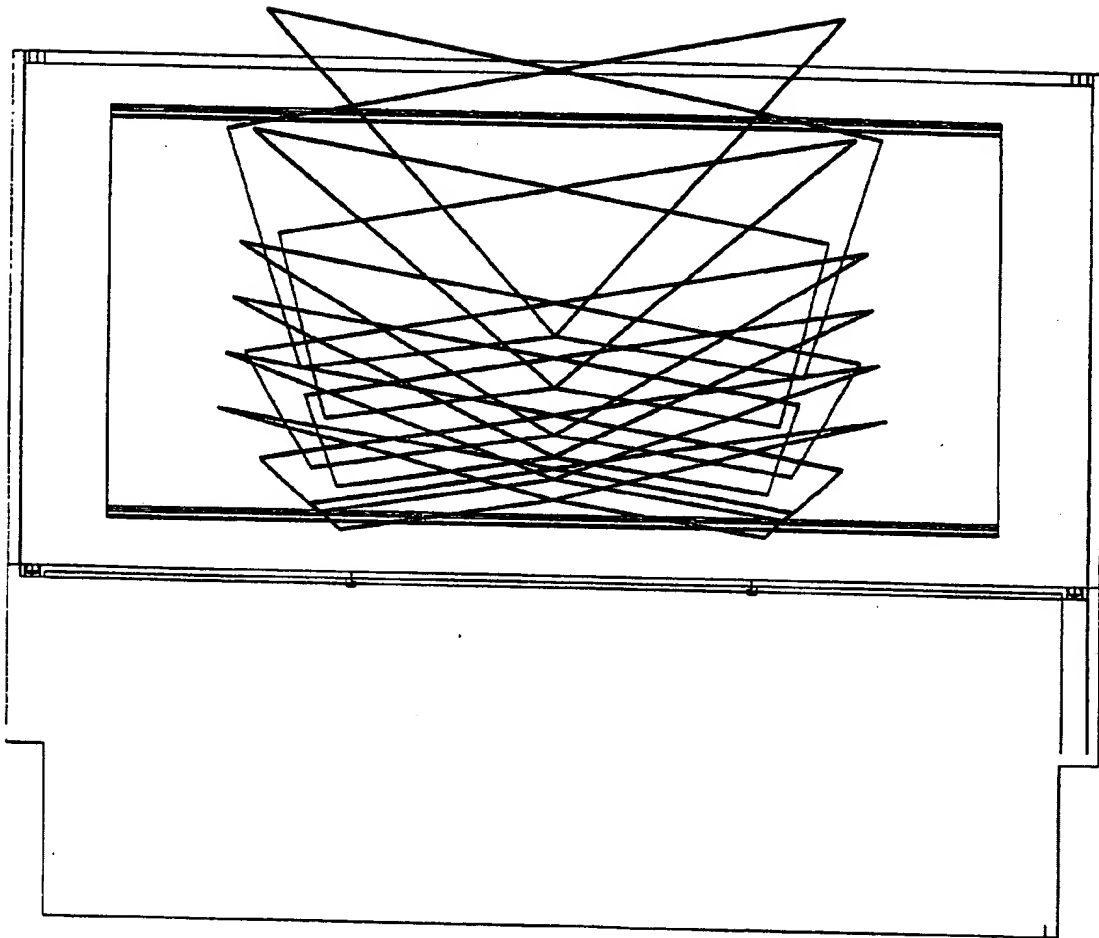


FIG. 5N3

THE UNIVERSITY OF CHICAGO

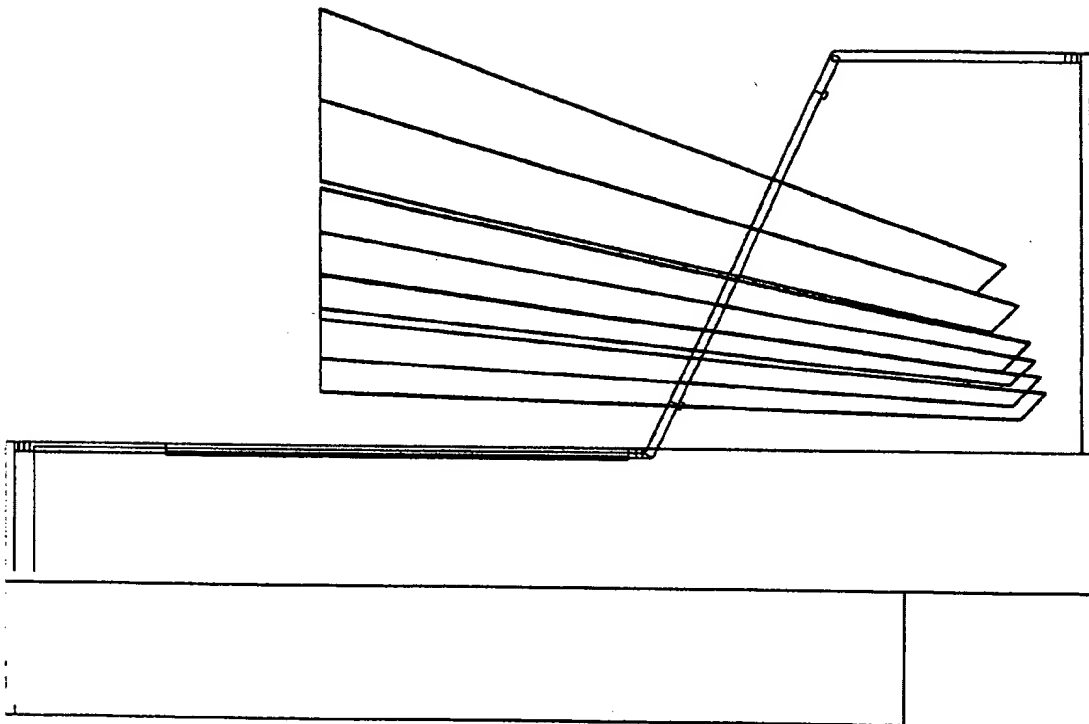


FIG. 5W4

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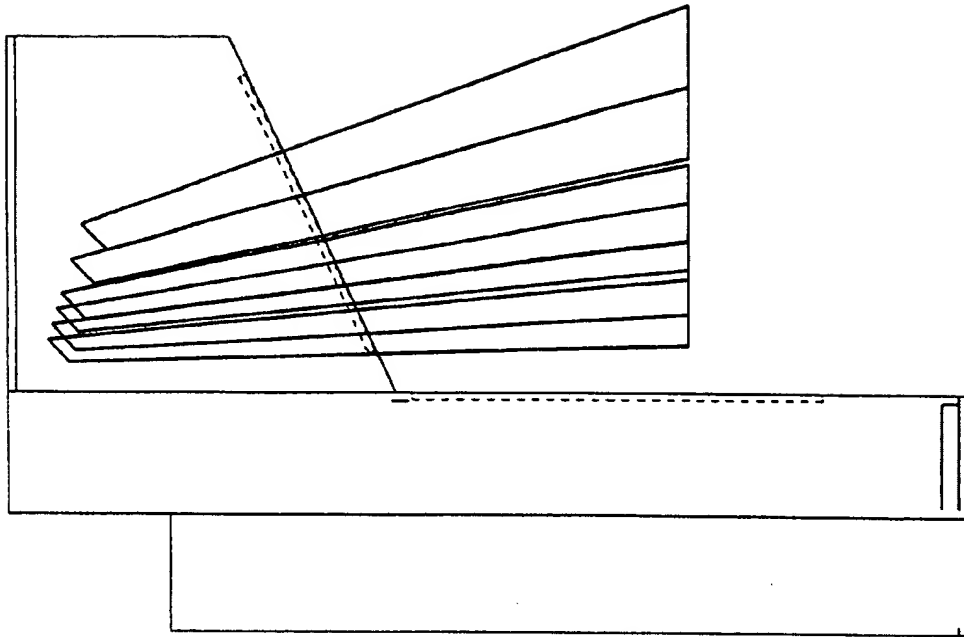


FIG. 5N5

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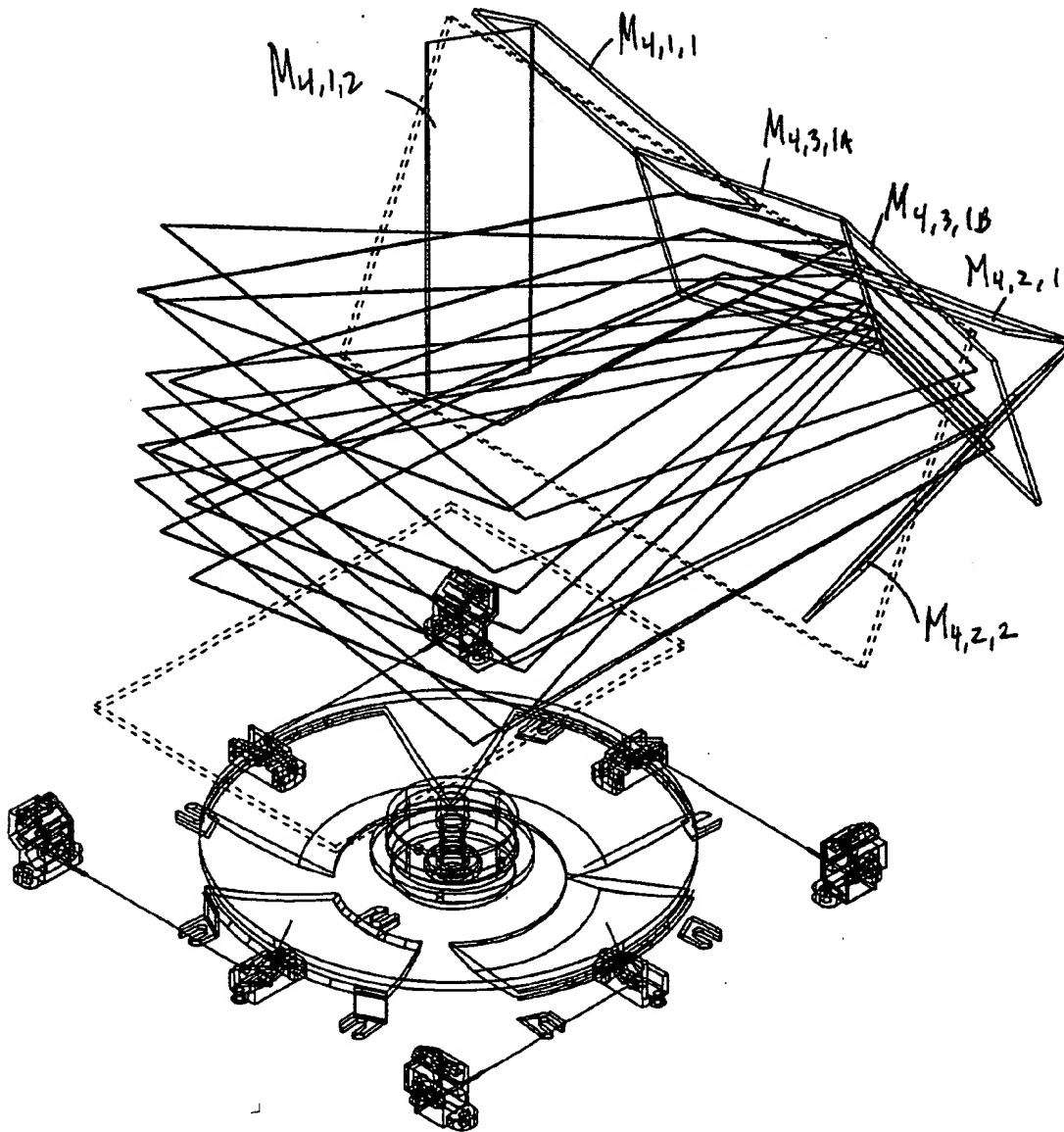


FIG. 5X1

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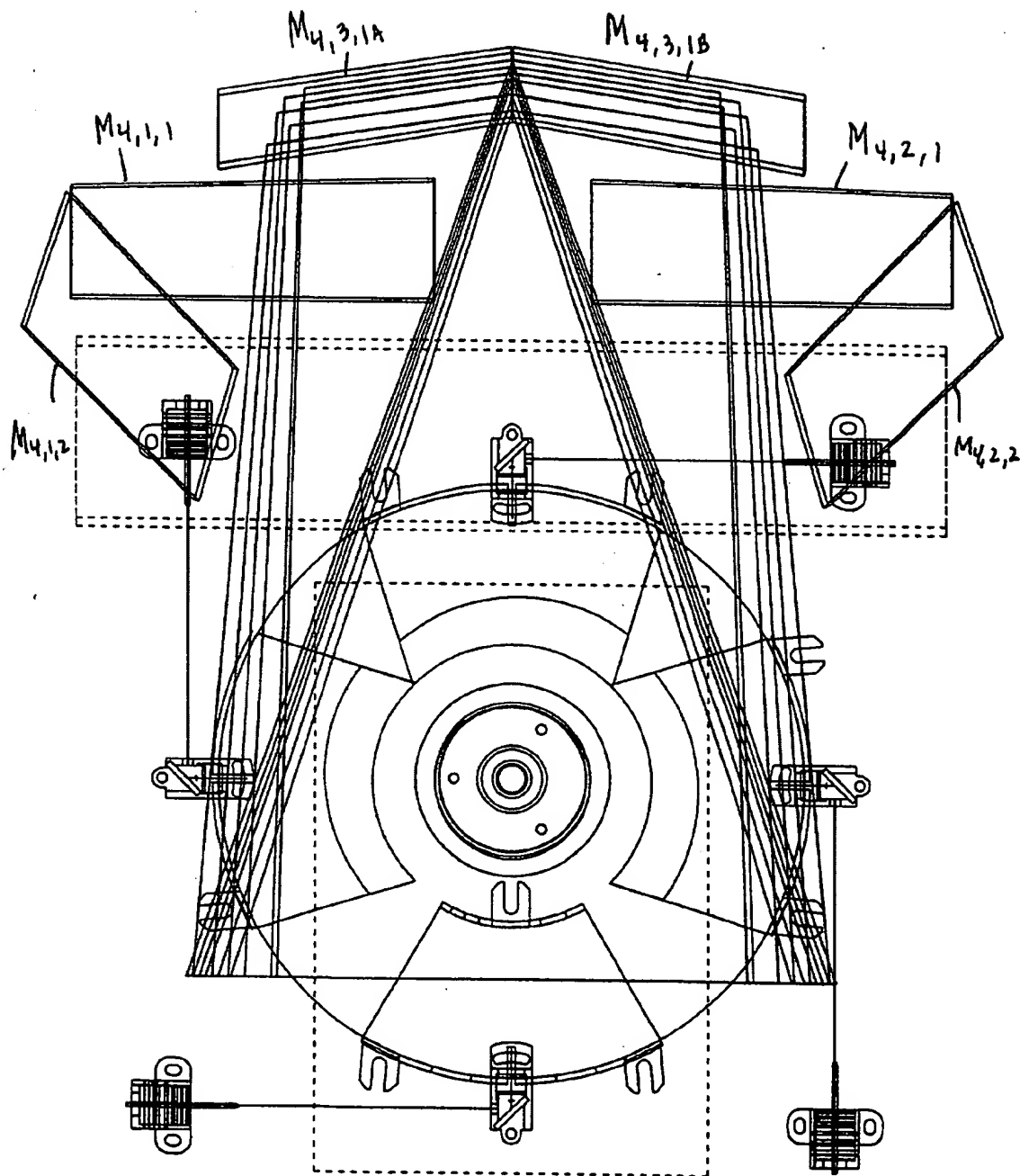


FIG. 5X2

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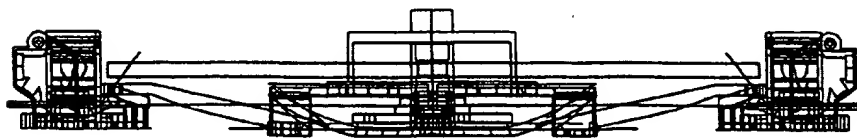
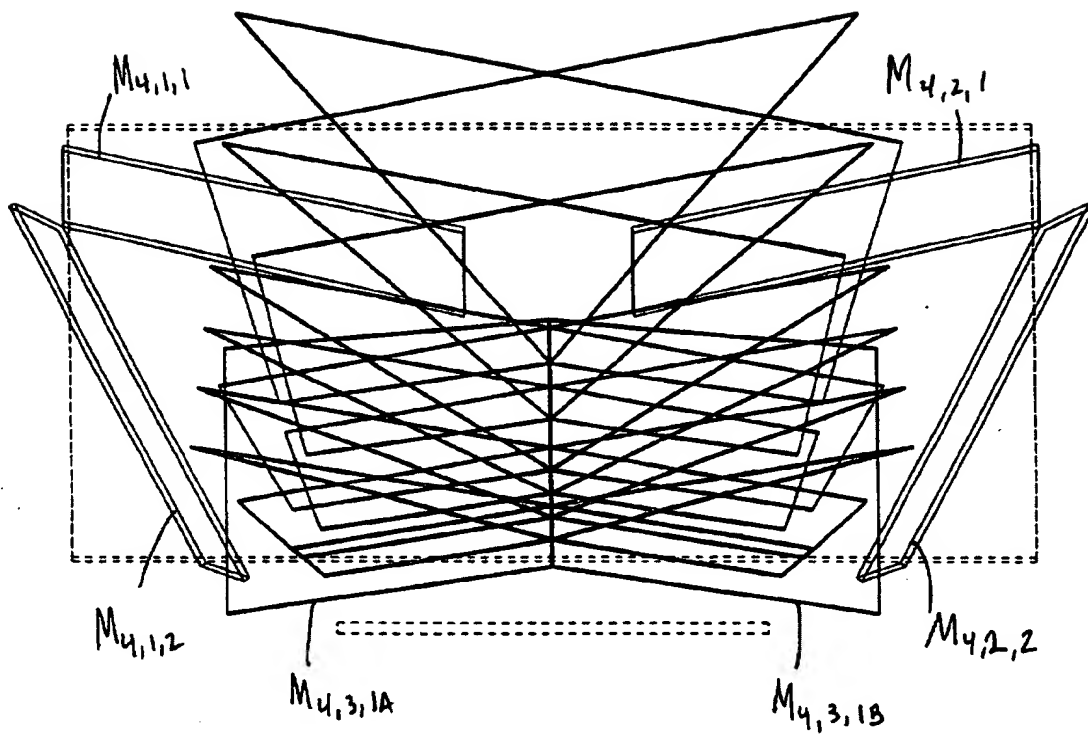


FIG. 5X3

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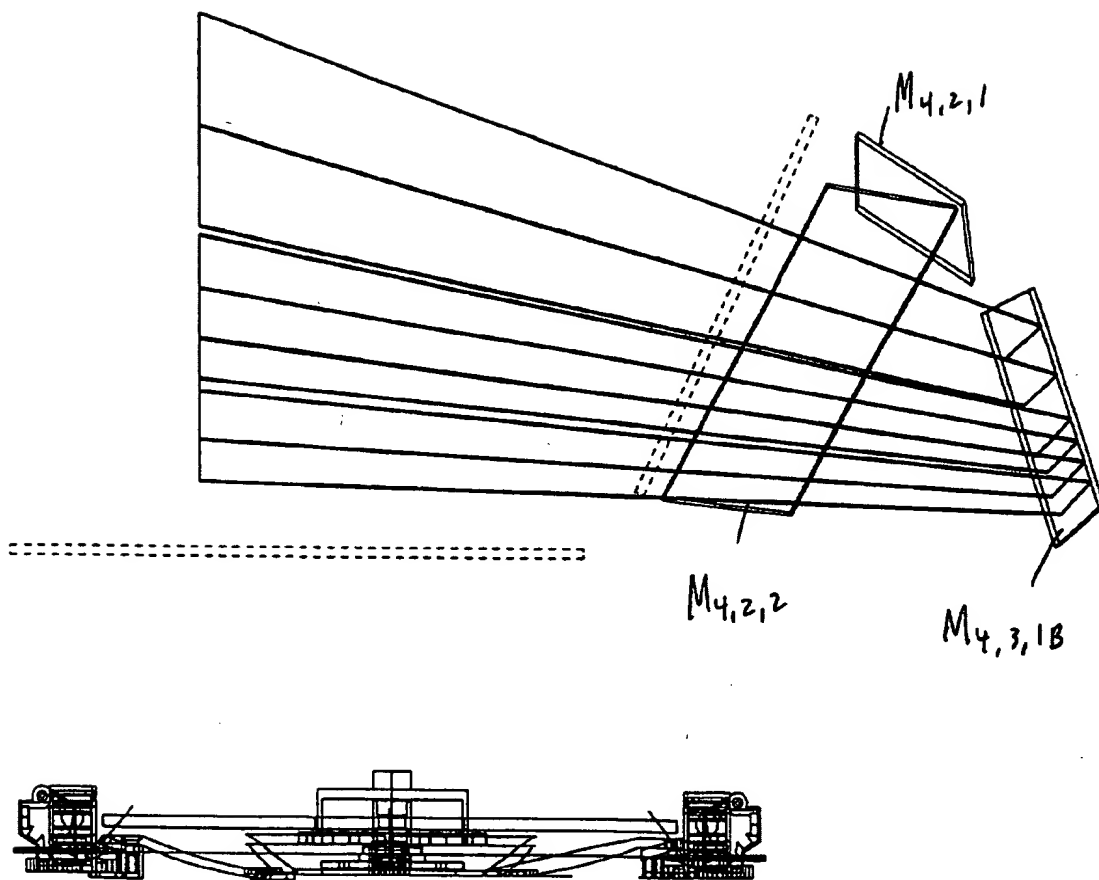


FIG. 5X4

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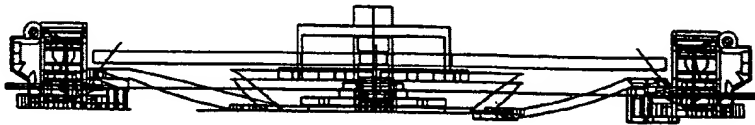
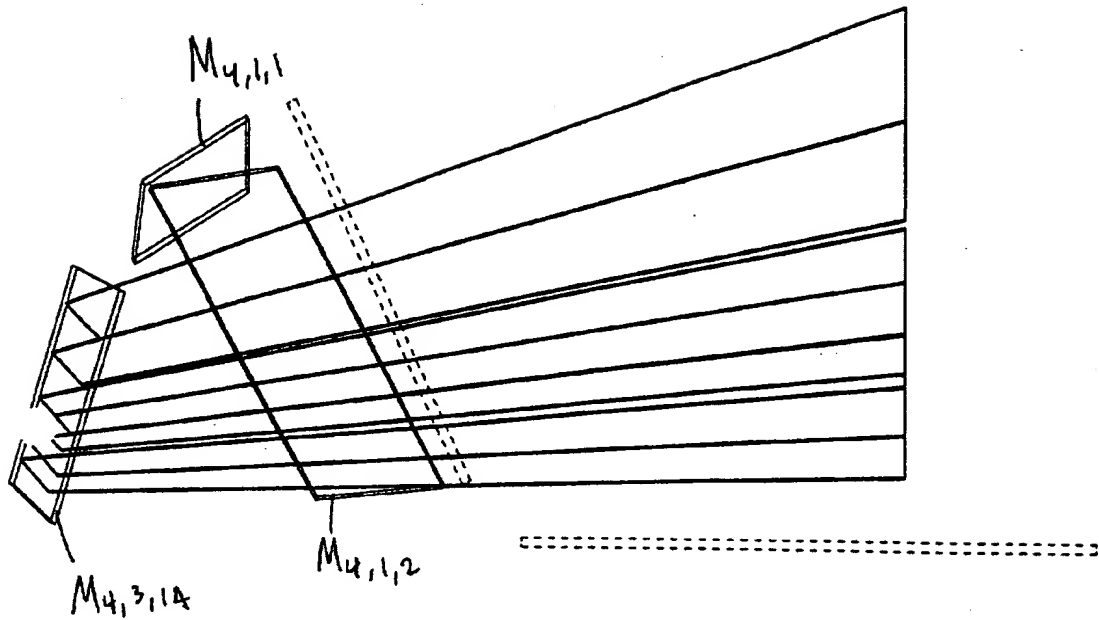


FIG. 5X5

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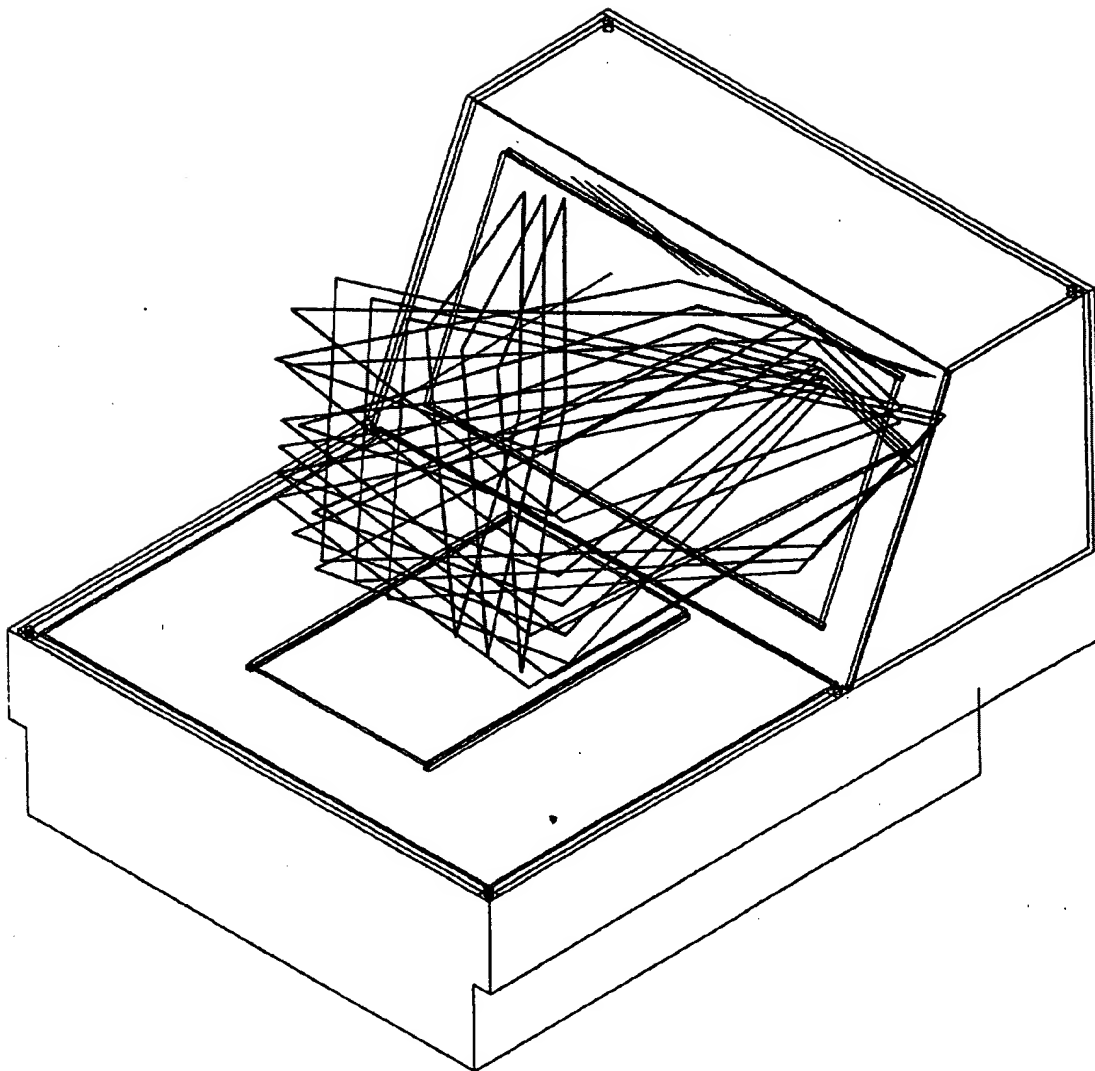


FIG. 5Y1

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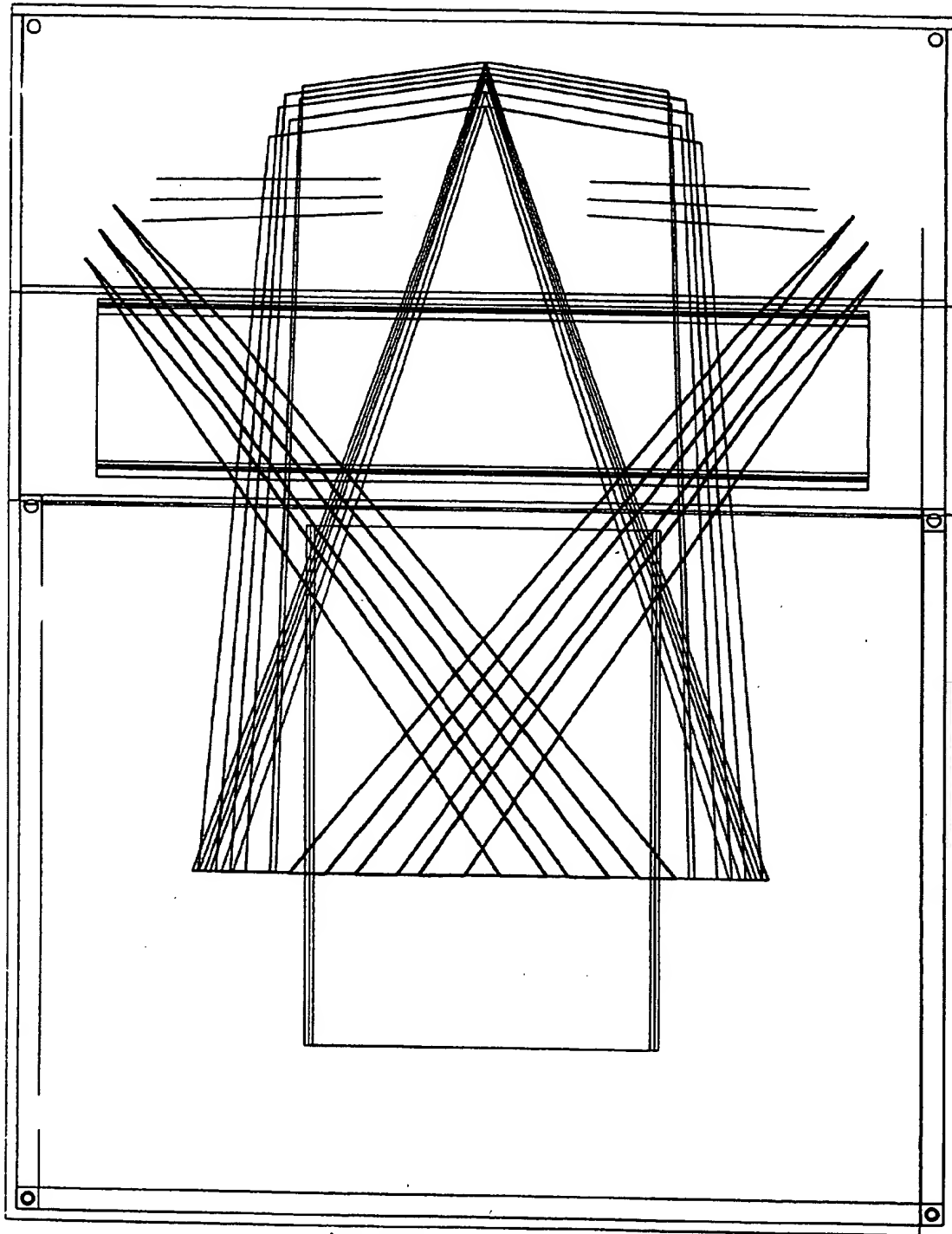


FIG. 5Y2

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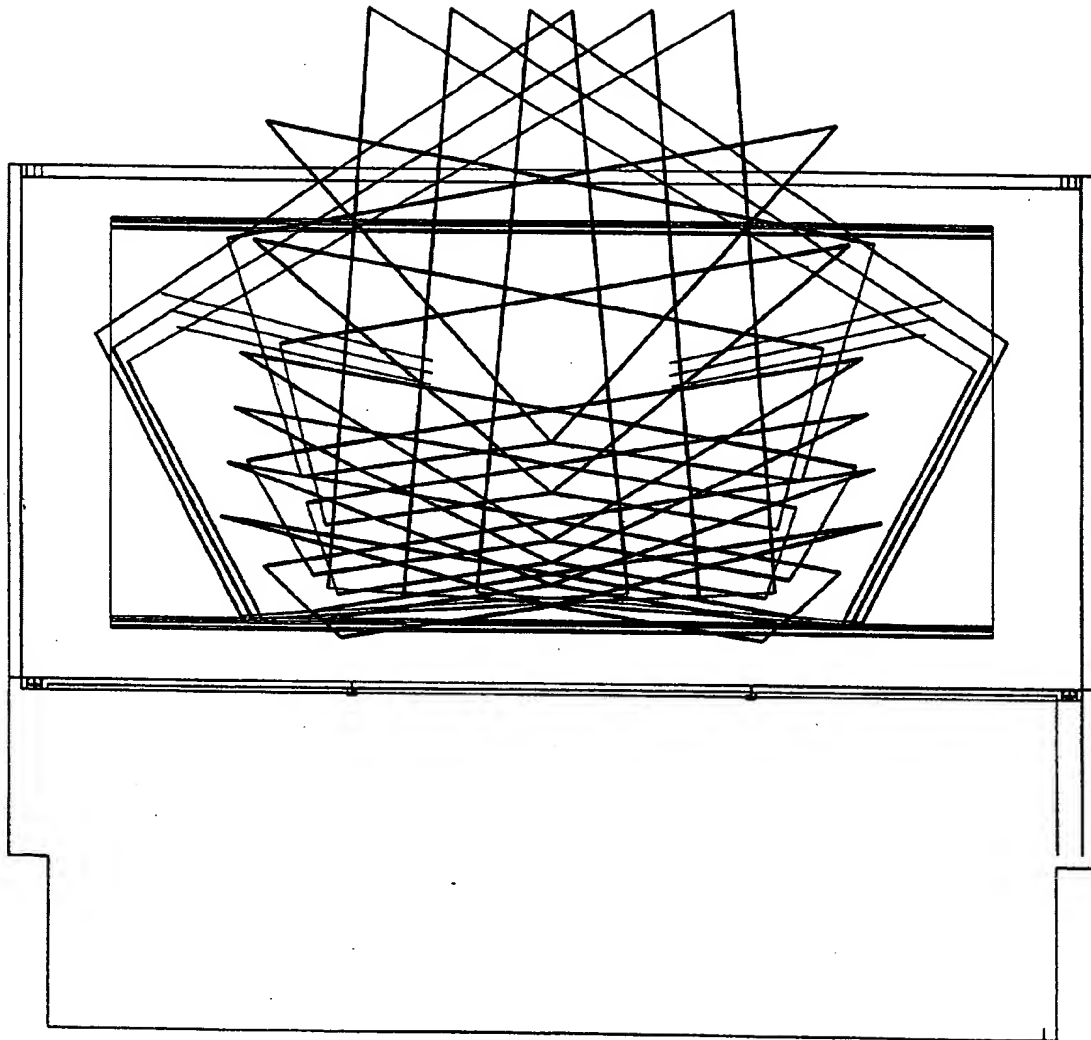


FIG. 543

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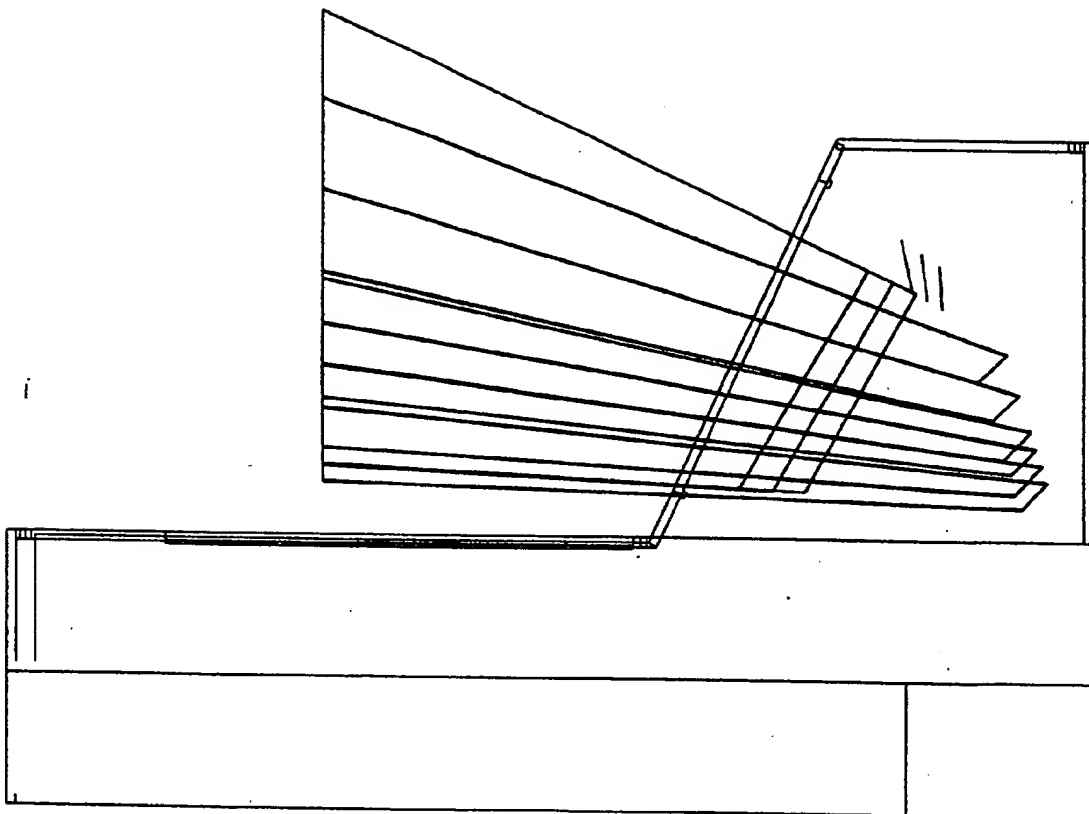


FIG. 5y4

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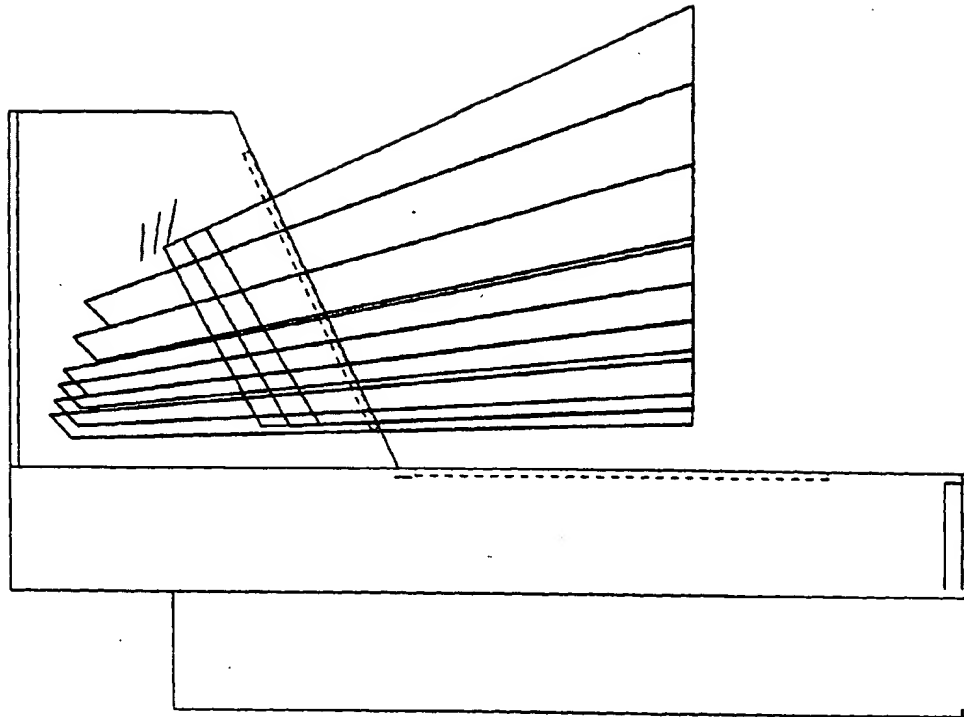


FIG. 545

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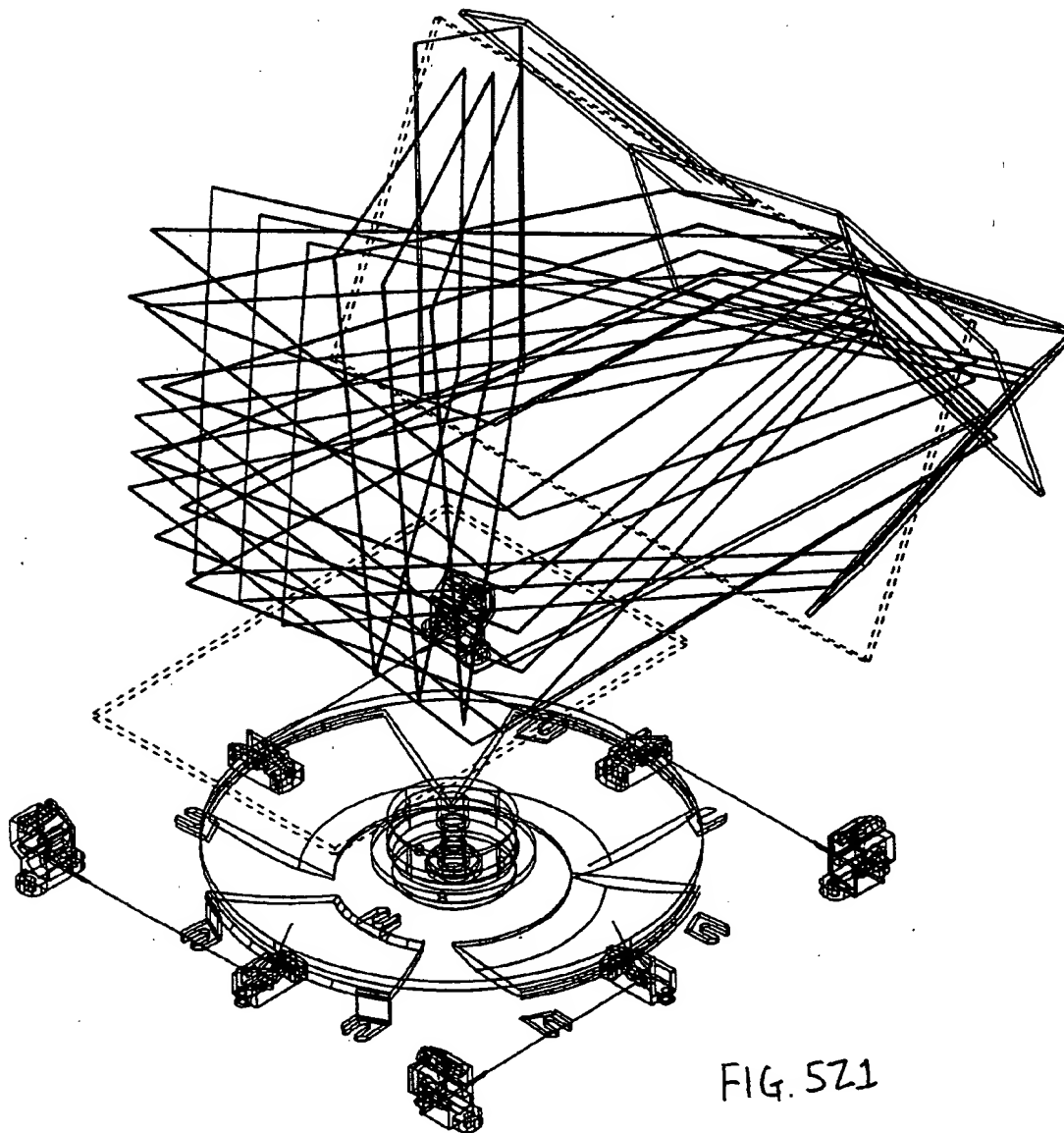


FIG. 5Z1

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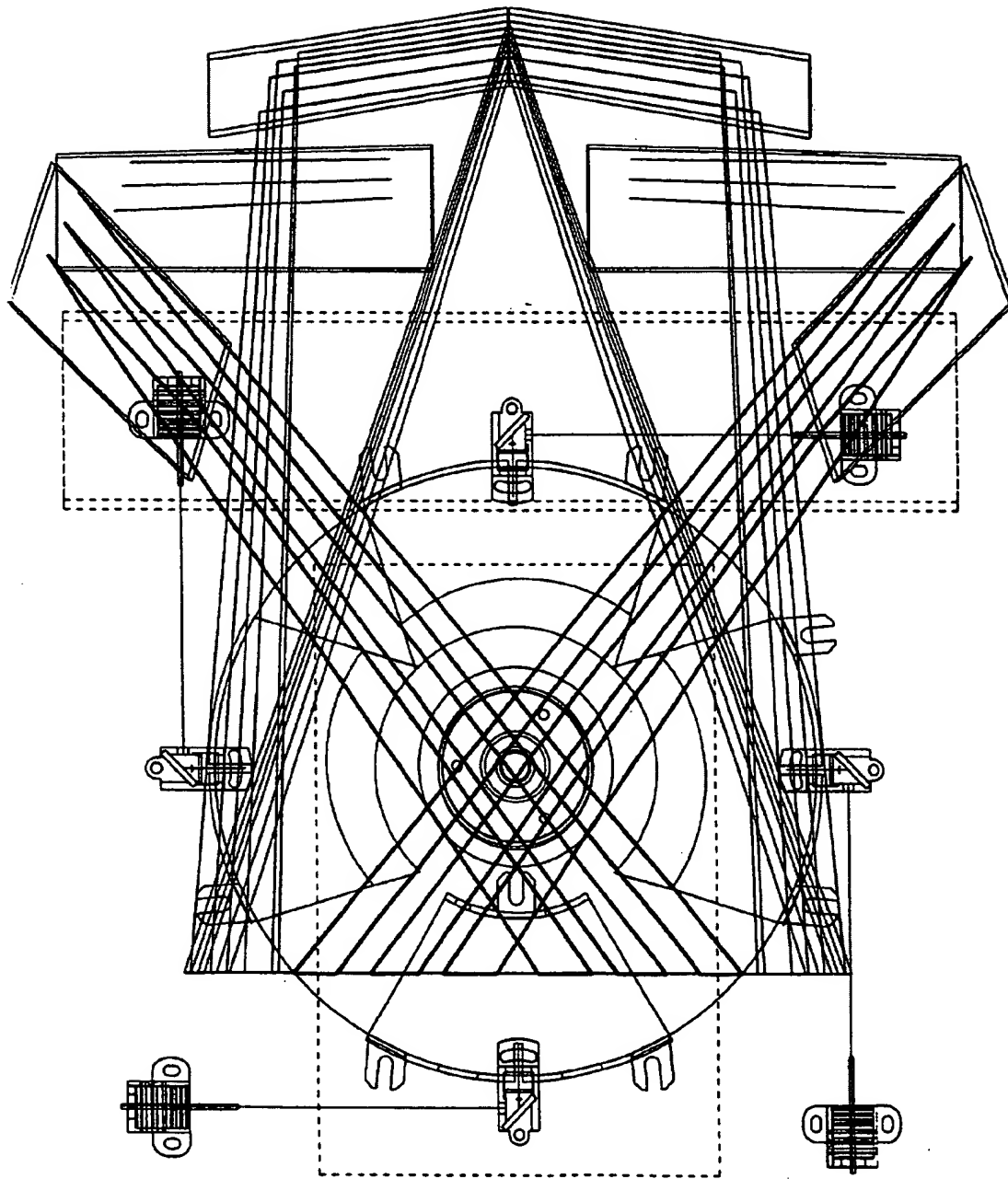


FIG. 572

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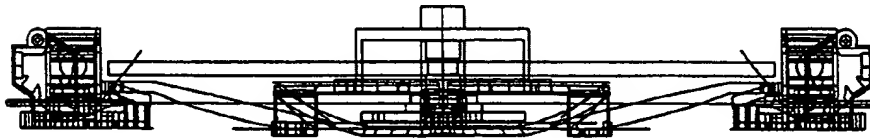
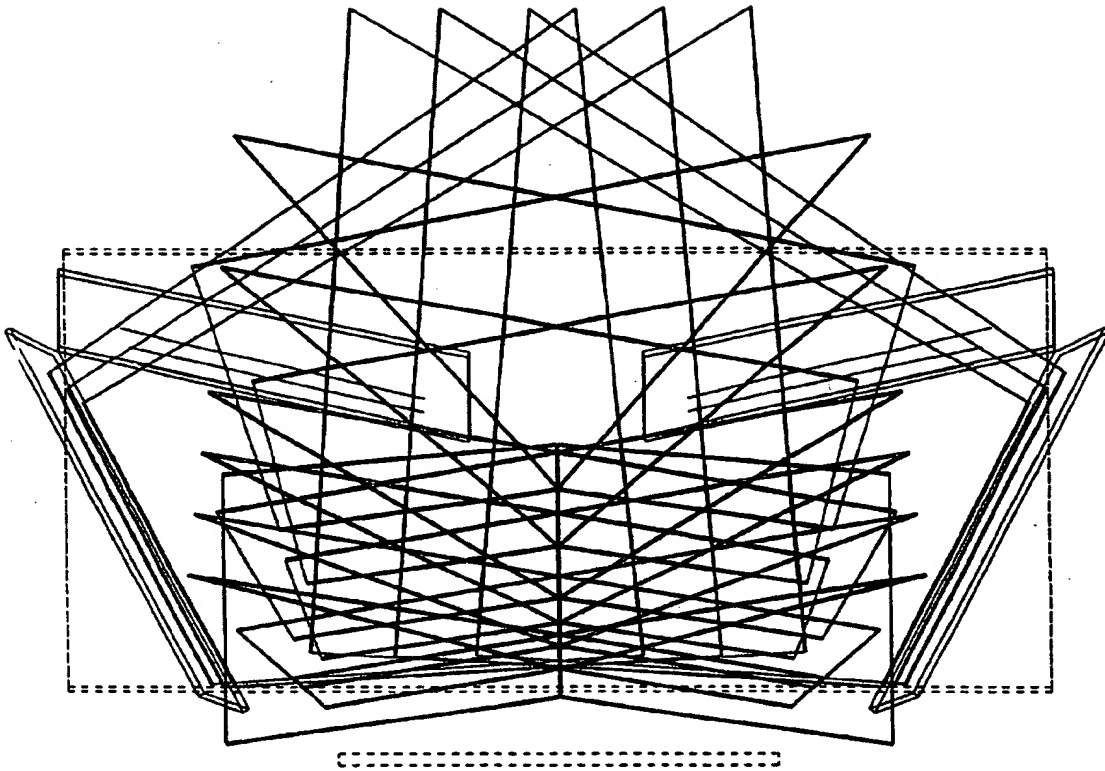


FIG. 523

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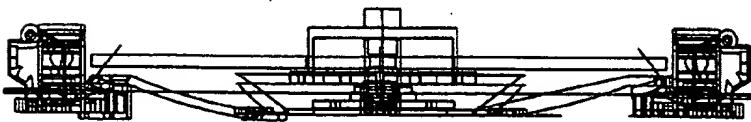
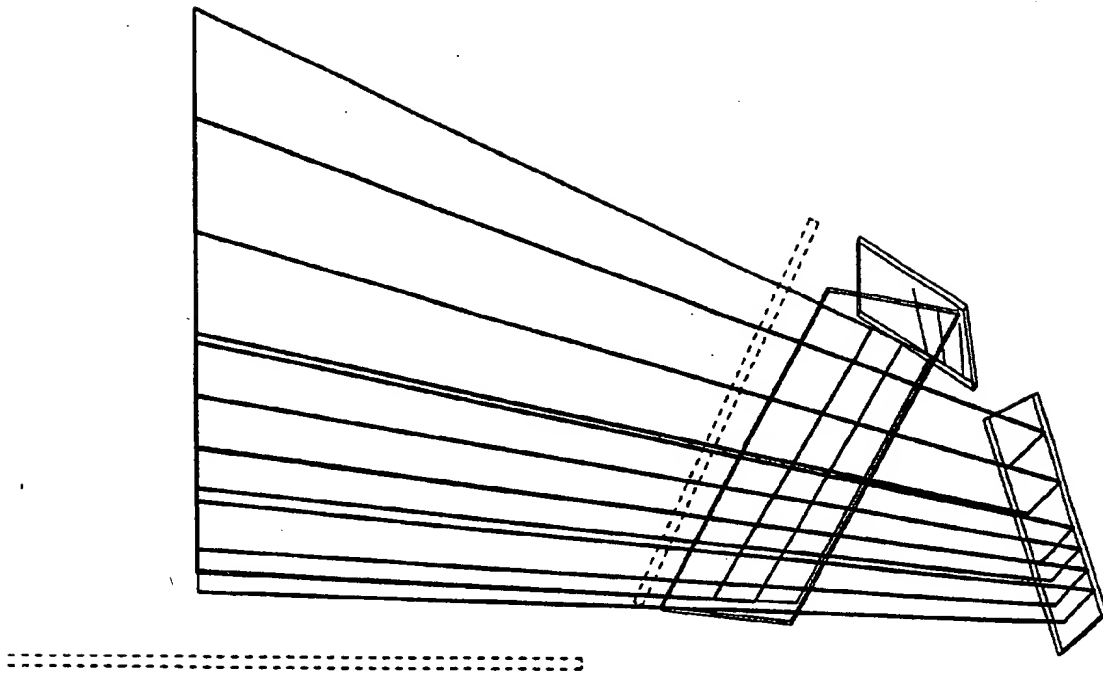


FIG. 524

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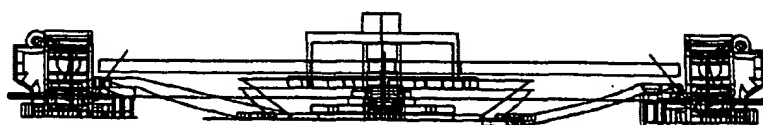
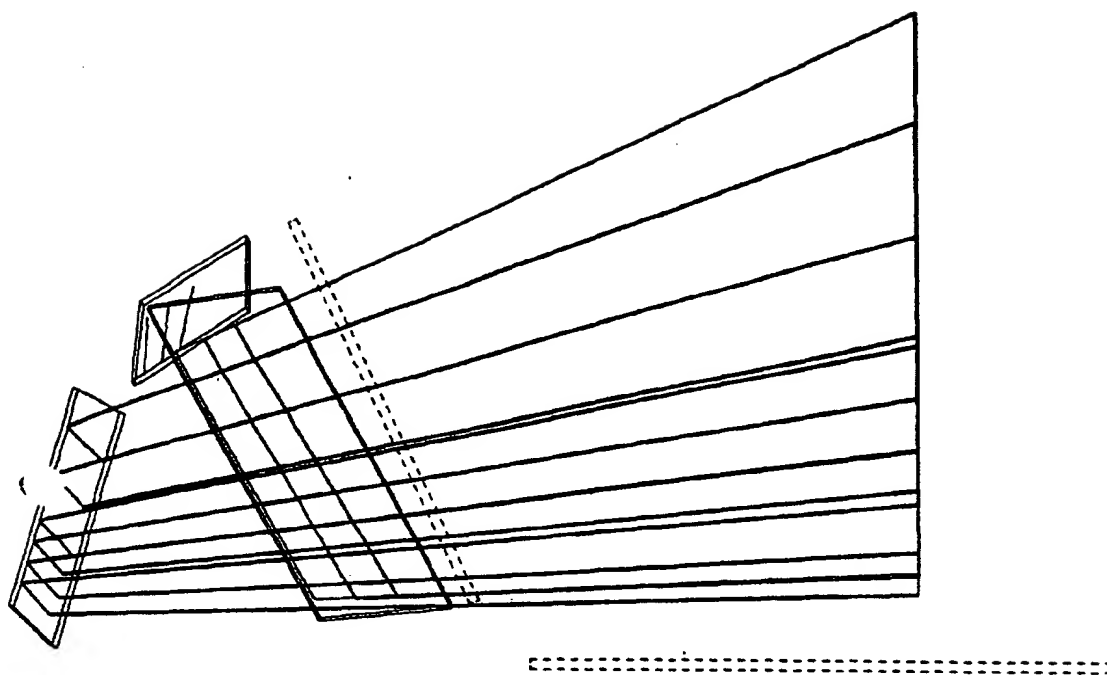


FIG. 575

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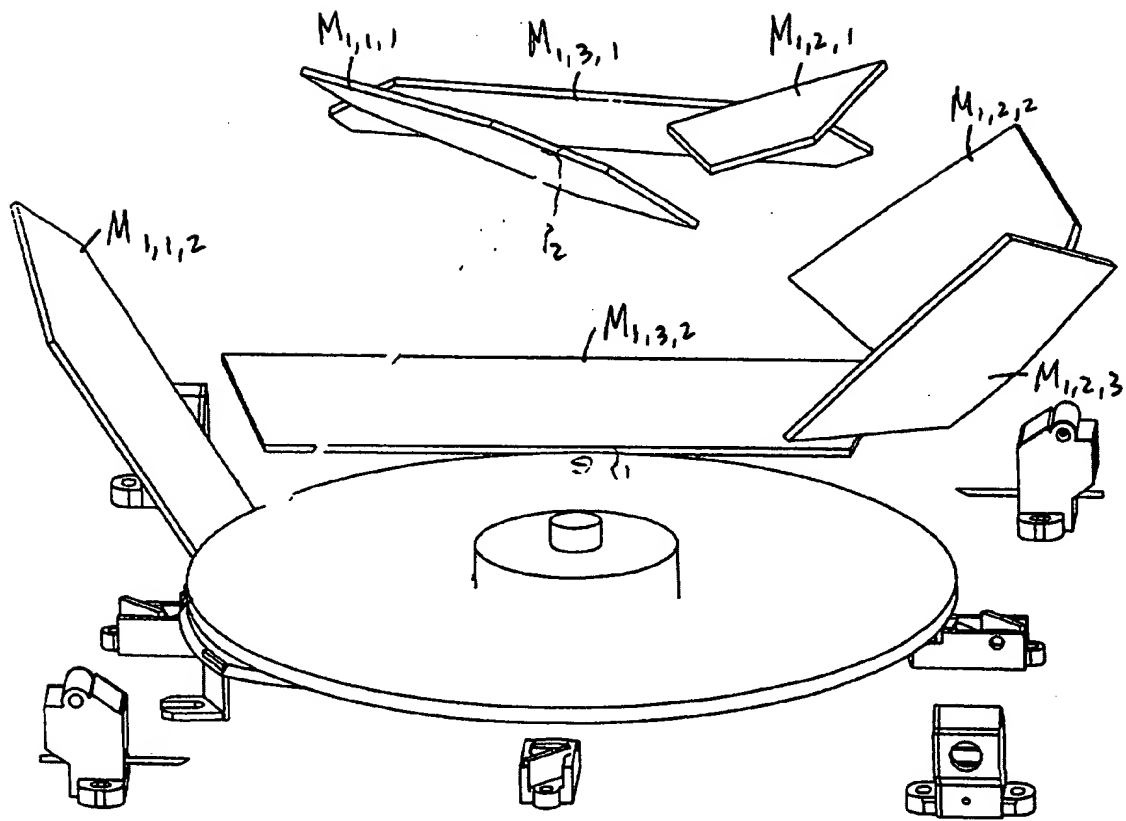


FIG. 6A1

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	N	O	P	Q	R	S	T	U	V	W	X
1											
2											
3											
4	Facet	7									
5	x	y	z								
6	-0.616	0.000	0.788								
7		End									
8	x	y	z								
9	0.419	0.416	0.807								
10	-0.253	0.917	-0.310								
11	-0.469	-0.414	0.781								
12											
13											
14											
15											
16	x	y	z								
17	3.900	2.438	2.770								
18	4.100	1.879	2.400								
19	3.600	0.137	1.800								
20	3.150	-0.737	1.800								
21	2.500	-0.159	2.450								
22	2.650	0.757	2.770								
23											
24											

FIG. 6A2

Station 1

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	A	B	C	D	E	F	G	H	I	J	K	L
1	Station 1											
2												
3												
4	High Elevation Left Skew	Facet	9									
5	(G2)	x	y	z								
6	Vector from Module	-0.616	0.000	0.788								
7		End										
8		x	y	z								
9	Output Vectors From Disk	0.378	0.445	0.812								
10	First Mirror Reflected Directions	-0.269	0.927	-0.263								
11	Second Mirror Reflected Directions	-0.478	-0.367	0.787								
12	Third Mirror Reflected Directions											
13												
14												
15												
16		1	3.900	2.436	2.770							
17		2	4.100	1.679	2.400							
18		3	3.800	0.137	1.800							
19		4	3.150	-0.737	1.800							
20		5	2.500	-0.159	2.450							
21		6	2.850	0.757	2.770							
22		7										
23		8										

FIG. 6A3

Station 1

	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1											
2											
3											
4	Facet	11									
5	x	y	z								
6	-0.616	0.000	0.788								
7		End				Middle				End	
8	x	y	z	x	y	z	x	y	z		
9	0.333	0.476	0.814	0.415	0.220	0.883	0.433	0.086	0.897		
10	-0.284	0.935	-0.211	-0.382	0.813	-0.440	-0.429	0.728	-0.535		
11	-0.487	-0.316	0.814	-0.594	-0.496	0.633	-0.638	-0.564	0.524		
12											
13											
14											
15		Mirror 1 Corners				Mirror 2 Corners				Mirror 3 Corners	
16	x	y	z	x	y	z	x	y	z		
17	3.900	2.436	2.770	1.700	4.102	1.300					
18	4.100	1.879	2.400	3.300	4.400	1.980					
19	3.800	0.137	1.800	3.400	3.990	1.500					
20	3.150	-0.737	1.800	2.300	2.427	-0.625					
21	2.500	-0.159	2.450	1.700	2.524	-0.625					
22	2.650	0.757	2.770	1.050	3.101	-0.050					
23											
24											

FIG. 6A4

Station 1

199/335

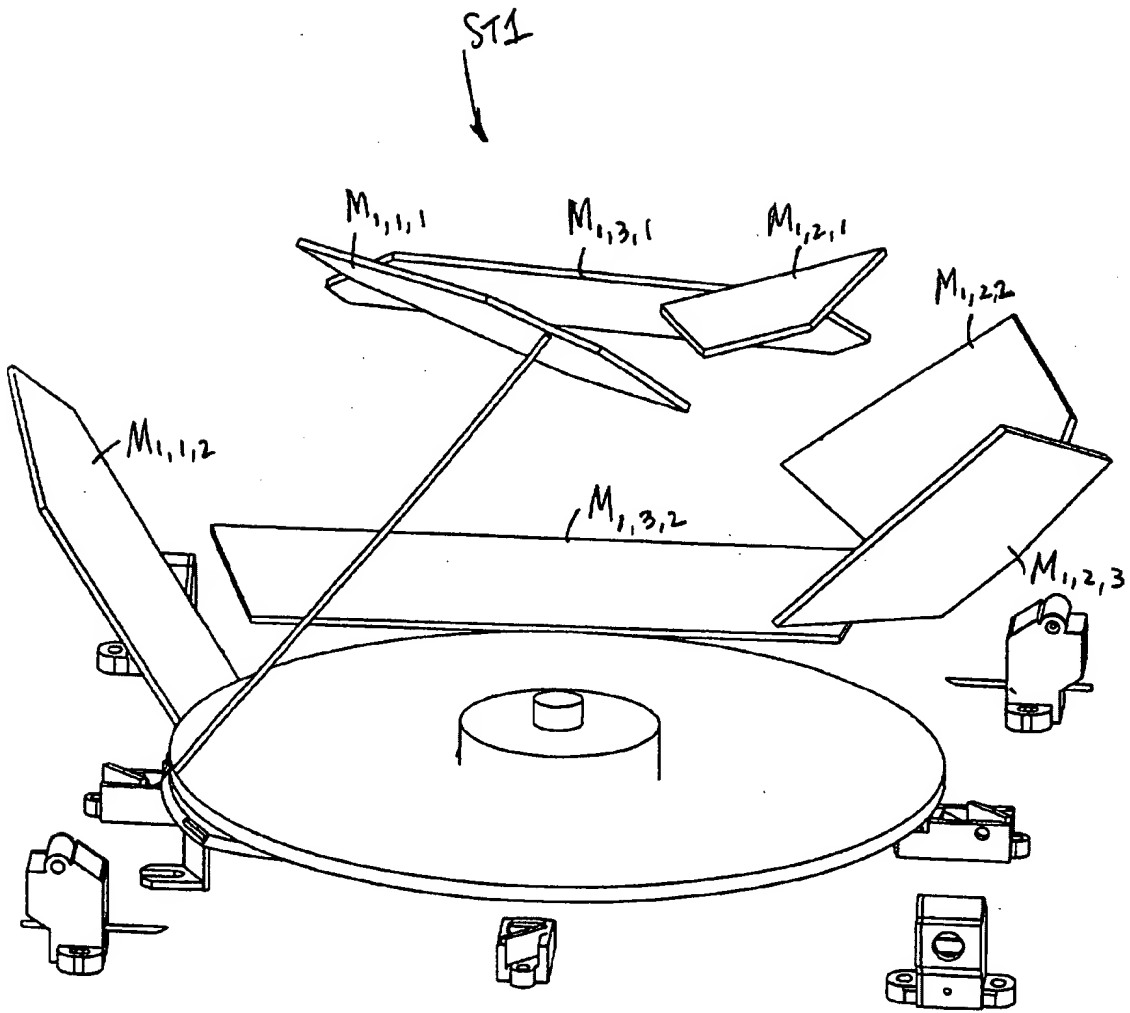


FIG. 6B1

FIG. 6B2

Station 1

201/335

	A	B	C	D	E	F	G	H	I	J	K	L
25	High Elevation Right Skew	Facet	10									
26	(G1)	x	y	z								
27	Vector from Module	-0.616	0.000	0.788								
28		End										
29		x	y	z								
30	Output Vectors From Disk	0.441	-0.235	0.866								
31	First Mirror Reflected Directions	0.380	-0.673	-0.635								
32	Second Mirror Reflected Directions	-0.998	0.000	-0.087								
33	Third Mirror Reflected Directions	-0.589	0.553	0.589								
34												
35		Mirror 1 Corners										
36		x	y	z								
37	1	2.550	-1.630	2.650								
38	2	4.150	-2.267	2.770								
39	3	3.950	0.196	2.060								
40	4	2.420	-0.308	2.270								
41	5											
42	6											
43	7											
44	8											
45												

FIG. 6B3

Station 1

202/385

Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
25 Facet	12									
26 x	y	z								
27 -0.616	0.000	0.788								
28	End				Middle				End	
29 x	y	z	x	y	z	x	y	z		
30 0.416	-0.220	0.883	0.415	-0.220	0.883	0.369	-0.387	0.845		
31 0.351	-0.669	-0.655	0.351	-0.669	-0.655	0.312	-0.788	-0.530		
32 -0.895	-0.012	-0.099	-0.895	-0.012	-0.099	-0.988	-0.153	0.007		
33 -0.562	0.574	0.596	-0.562	0.574	0.596	-0.550	0.439	0.710		
34										
35 Mirror 1 Corners										
36 x	y	z								
37 2.550	-1.630	2.650	4.000	-2.630	0.049	3.746	-3.750	1.000		
38 4.150	-2.267	2.770	4.900	-1.400	0.775	1.371	-3.300	2.100		
39 3.950	0.198	2.060	4.800	-3.150	2.118	1.159	-1.600	0.800		
40 2.420	-0.308	2.270	3.800	-3.900	1.067	2.824	-2.000	0.100		
41						3.771	-2.700	0.100		
42										
43										
44										
45										

FIG. 6B4

Station 1

203/335

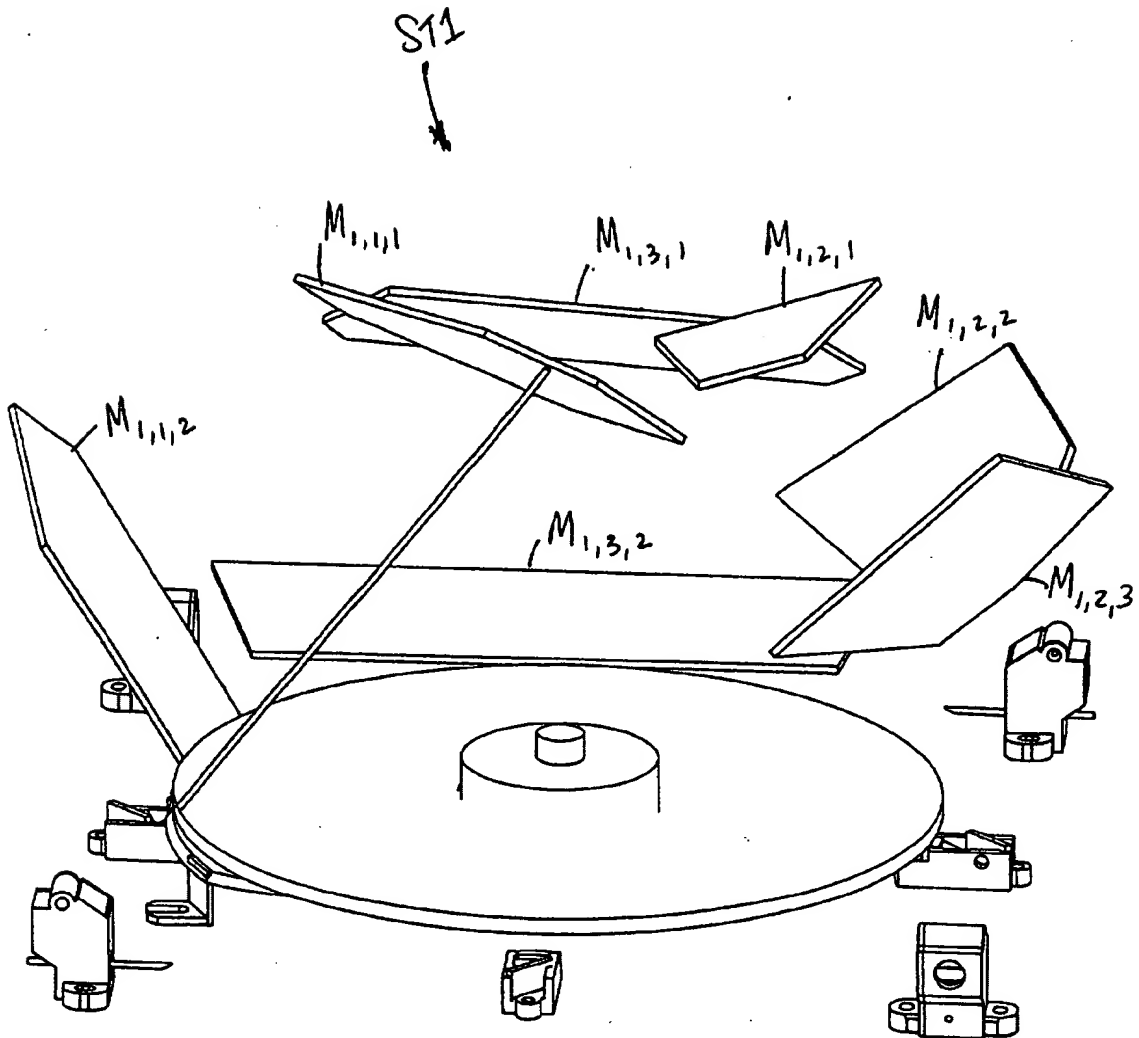


FIG. 6C1

	N	O	P	Q	R	S	T	U	V	W	X
46	Facet	1									
47	x	y	z								
48	-0.616	0.000	0.788								
49		End				Middle				End	
50	x	y	z		x	y	z		x	y	z
51	0.753	0.321	0.575		0.788	0.000	0.616		0.753	-0.321	0.575
52	-0.368	0.443	-0.819		-0.425	0.132	-0.898		-0.421	-0.193	-0.887
53	-0.574	0.468	0.672		-0.653	0.160	0.740		-0.648	-0.165	0.743
54											
55											
56	Mirror 1 Corners					Mirror 2 Corners				Mirror 3 Corners	
57	x	y	z		x	y	z		x	y	z
58	4.250	1.500	2.547		3.150	2.450	0.030				
59	4.950	2.000	2.029		4.500	2.800	0.213				
60	5.150	1.800	1.851		4.350	-2.200	0.277				
61	5.000	-1.800	1.856		3.050	-1.850	0.089				
62	4.750	-1.850	1.844								
63	4.100	-1.500	2.405								
64											
65											

FIG. 6C2

205/335

	A	B	C	D	E	F	G	H	I	J	K	L
46	Low Elevation	Facet	2									
47	(G3)	x	y	z								
48	Vector from Module	-0.616	0.000	0.788								
49			End									
50		x	y	z								
51	Output Vectors From Disk	0.734	0.305	0.607								
52	First Mirror Reflected Directions	-0.402	0.428	-0.809								
53	Second Mirror Reflected Directions	-0.607	0.454	0.653								
54	Third Mirror Reflected Directions											
55												
56												
57		x	y	z								
58		1	4.250	1.500	2.547							
59		2	4.950	2.000	2.028							
60		3	5.150	1.800	1.851							
61		4	5.000	-1.800	1.656							
62		5	4.750	-1.950	1.844							
63		6	4.100	-1.500	2.405							
64		7										
65		8										

FIG. 6C3

Station 1

206/335

Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
46 Facet	3									
47 x	y	z								
48 -0.616	0.000	0.788								
49	End				Middle				End	
50 x	y	z		x	y	z		x	y	z
51 0.714	0.290	0.638		0.743	0.000	0.669		0.709	-0.311	0.633
52 -0.438	0.416	-0.797		-0.487	0.134	-0.863		-0.485	-0.181	-0.855
53 -0.638	0.440	0.632		-0.704	0.161	0.692		-0.702	-0.155	0.695
54										
55										
56	Mirror 1 Corners			Mirror 2 Corners				Mirror 3 Corners		
57 x	y	z		x	y	z		x	y	z
58 4.250	1.500	2.547		3.150	2.450	0.030				
59 4.950	2.000	2.029		4.500	2.800	0.213				
60 5.150	1.800	1.851		4.350	-2.200	0.277				
61 5.000	-1.800	1.656		3.050	-1.850	0.089				
62 4.750	-1.950	1.844								
63 4.100	-1.500	2.405								
64										
65										

FIG. 6C4

Station 1

FIG. 6C5

Station 1

Station 1

208/335

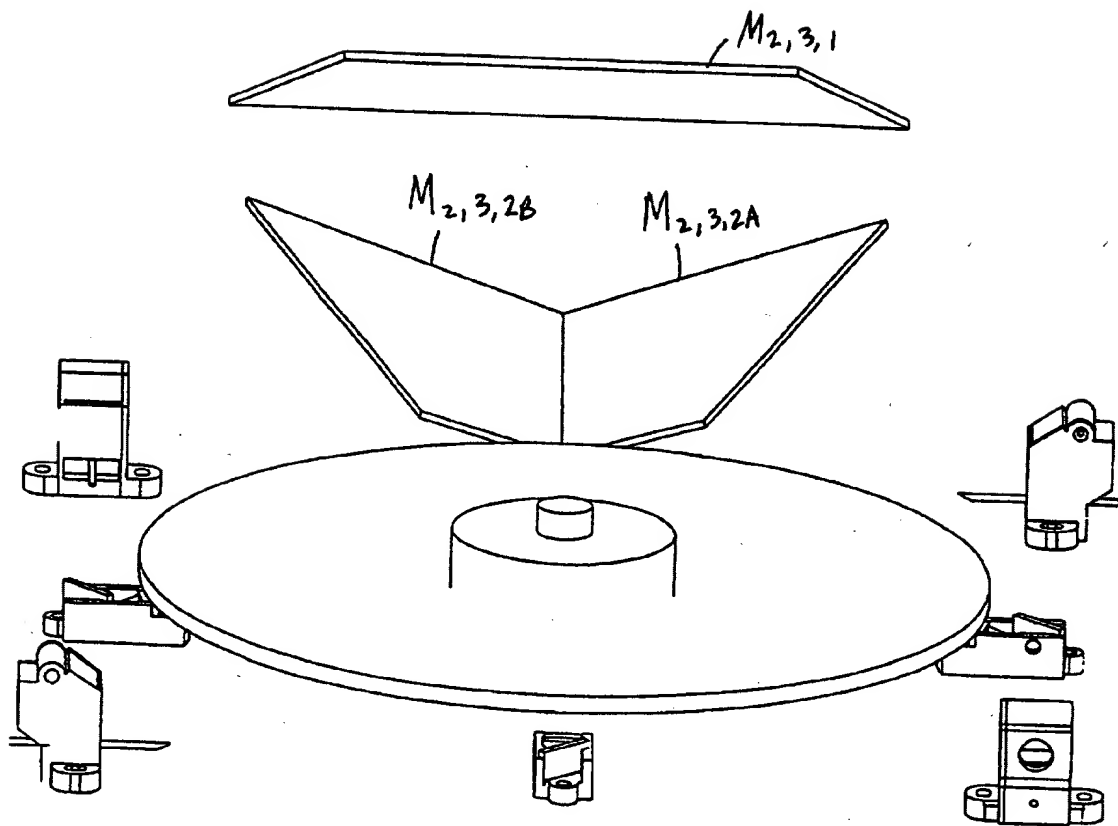


FIG. 6D1

209/335

N	O	P	Q	R	S	T	U	V	W	X
46	Facet	1								
47	x	y	z							
48	-0.616	0.000	0.788							
49		End								
50	x	y	z							
51	0.788	0.000	0.616							
52	-0.140	0.000	-0.990							
53	-0.595	0.448	0.687							
54										
55										
56										
57	x	y	z							
58	3.750	-1.600	2.509							
59	5.100	-2.400	1.728							
60	5.100	2.400	1.728							
61	3.750	1.600	2.509							
62										
63										
64										
65										
66										
67										
68										
69	This station uses a split mirror for mirror #2. The second part of mirror 2 is the abo									
70										
71										
72										
73										
74										
75										
76										

FIG. 6D2

Station 2

210/335

Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
46 Facet	2									
47 x	y	z								
48 -0.616	0.000	0.788								
49	End				Middle				End	
50 x	y	z		x	y	z		x	y	z
51 0.766	0.000	0.643		0.766	0.000	0.643		0.711	-0.395	0.581
52 -0.175	0.000	-0.985		-0.175	0.000	-0.985		-0.149	-0.395	-0.907
53 -0.623	0.440	0.647		-0.623	0.440	0.647		-0.614	0.062	0.787
54										
55										
56	Mirror 1 Corners									
57 x	y	z		x	y	z		x	y	z
58 3.750	-1.600	2.509		3.000	0.000	-0.112				
59 5.100	-2.400	1.728		4.800	0.000	0.382				
60 5.100	2.400	1.728		5.071	-2.256	1.066				
61 3.750	1.600	2.509		5.071	-2.256	1.066				
62				3.060	-1.000	0.175				
63										
64										
65										
66										
67										
68										
69	This station uses a split mirror for mirror #2. The second part of mirror 2 is the abo									
70										
71				3.000	0.000	-0.112				
72				4.800	0.000	0.382				
73				5.071	2.256	1.066				
74				5.071	2.256	1.066				
75				3.060	1.000	0.175				
76										

FIG. 6D3

Station 2

211/335

	A	B	C	D	E	F	G	H	I	J	K	L
46	Low Elevation	Facet	3									
47		x	y	z								
48	Vector from Module	-0.616	0.000	0.788								
49			End				Middle				End	
50		x	y	z		x	y	z		x	y	z
61	Output Vectors From Disk	0.743	0.000	0.669		0.743	0.000	0.669		0.697	-0.362	0.619
52	First Mirror Reflected Directions	-0.209	0.000	-0.978		-0.209	0.000	-0.978		-0.189	-0.362	-0.913
53	Second Mirror Reflected Directions	-0.849	0.433	0.625		-0.849	0.433	0.625		-0.648	0.069	0.757
54	Third Mirror Reflected Directions											
55												
56												
57												
58		x	y	z		x	y	z		x	y	z
59		1	3.750	-1.600	2.509		3.000	0.000	-0.112			
60		2	5.100	-2.400	1.728		4.800	0.000	0.382			
61		3	5.100	2.400	1.728		5.071	-2.256	1.066			
62		4	3.750	1.600	2.509		5.071	-2.256	1.066			
63		5					3.060	-1.000	0.175			
64		6										
65		7										
66		8										
67												
68												
69	Note: Special Case!	This station uses a split mirror for mirror #2. The second part of mirror 2 is the abo										
70												
71	Second Part of Mirror 2						3.000	0.000	-0.112			
72							4.800	0.000	0.382			
73							5.071	2.256	1.066			
74							5.071	2.256	1.066			
75							3.060	1.000	0.175			
76												
77												

FIG. 6D4

Station 2

212/335

	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
46	Facet	4									
47	x	y	z								
48	-0.616	0.000	0.788								
49		End									
50	x	y	z								
51	0.719	0.000	0.695								
52	-0.243	0.000	-0.970								
53	-0.675	0.425	0.603								
54											
55											
56											
57	x	y	z								
58	3.750	-1.600	2.509								
59	5.100	-2.400	1.728								
60	5.100	2.400	1.728								
61	3.750	1.600	2.509								
62											
63											
64											
65											
66											
67											
68											
69	This station uses a split mirror for mirror #2. The second part of mirror 2 is the above										
70											
71											
72											
73											
74											
75											
76											

FIG. 605

Station 2

213/335

	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH
46	Facet	5									
47	x	y	z								
48	-0.616	0.000	0.788								
49		End									
50	x	y	z								
51	0.669	0.000	0.743								
52	-0.310	0.000	-0.951								
53	-0.724	0.407	0.557								
54											
55											
56											
57											
58	3.750	-1.600	2.509								
59	5.100	-2.400	1.728								
60	5.100	2.400	1.728								
61	3.750	1.600	2.509								
62											
63											
64											
65											
66											
67											
68											
69	This station uses a split mirror for mirror #2. The second part of mirror 2 is the abo										
70											
71											
72											
73											
74											
75											
76											

FIG. 6D6

Station 2

214/335

	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX
46	Facet	6													
47	x	y	z												
48	-0.616	0.000	0.788												
49		End				Middle				End					
50	x	y	z		x	y	z		x	y	z				
51	0.616	0.000	0.788		0.616	0.000	0.788		0.596	-0.232	0.769				
52	-0.376	0.000	-0.927		-0.376	0.000	-0.927		-0.369	-0.232	-0.900				
53	-0.770	0.367	0.508		-0.770	0.367	0.508		-0.781	0.173	0.600				
54															
55															
56															
57	x	y	z		x	y	z		x	y	z				
58	3.750	-1.600	2.509		3.000	0.000	-0.112								
59	5.100	-2.400	1.728		4.800	0.000	0.382								
60	5.100	2.400	1.728		5.071	-2.256	1.066								
61	3.750	1.600	2.509		5.071	-2.256	1.066								
62					3.060	-1.000	0.175								
63															
64															
65															
66															
67															
68															
69	This station uses a split mirror for mirror #2. The second part of mirror 2 is the above mirrored about the y axis. I.e.:														
70															
71					3.000	0.000	-0.112								
72					4.800	0.000	0.382								
73					5.071	2.256	1.066								
74					5.071	2.256	1.066								
75					3.060	1.000	0.175								
76															

FIG. 6D7

Station 2

215/335

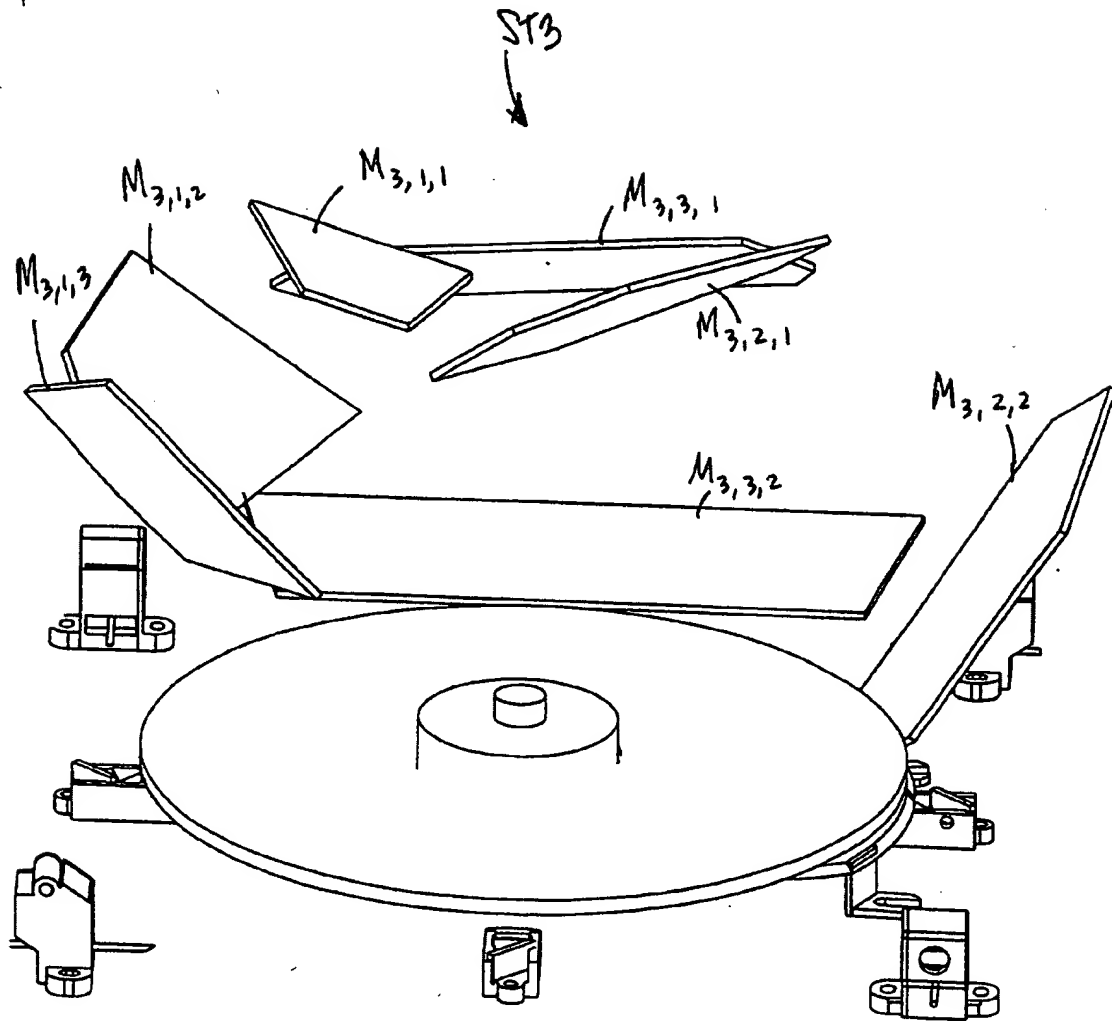


FIG. 6E1

216/335

	N	O	P	Q	R	S	T	U	V	W	X
1											
2											
3											
4	Facet	7									
5	x	y	z								
6	-0.616	0.000	0.788								
7	End				Middle				End		
8	x	y	z		x	y	z		x	y	z
9	0.468	0.249	0.848		0.468	0.249	0.848		0.430	0.387	0.816
10	0.408	0.675	-0.614		0.408	0.675	-0.614		0.375	0.774	-0.510
11	-0.999	-0.012	-0.034		-0.999	-0.012	-0.034		-0.983	0.108	0.054
12	-0.616	-0.531	0.582		-0.616	-0.531	0.582		-0.605	-0.419	0.677
13											
14	Mirror 1 Corners				Mirror 2 Corners				Mirror 3 Corners		
15	x	y	z		x	y	z		x	y	z
16	2.550	1.630	2.650		4.000	2.630	0.049		3.748	3.750	1.000
17	4.150	2.267	2.770		4.900	1.400	0.775		1.371	3.300	2.100
18	3.950	-0.196	2.060		4.600	3.150	2.118		1.159	1.600	0.800
19	2.420	0.308	2.270		3.800	3.900	1.067		2.824	2.000	0.100
20									3.771	2.700	0.100
21											
22											
23											
24											

FIG. 6E2

Station 3

217/335

A																									
Station 3	B	C	D	E	F	G	H	I	J	K	L														
1																									
2																									
3																									
4	High Elevation Left Skew																								
5 (G2)	Facet	9																							
6	Vector from Module	x	y	z																					
7		-0.616	0.000	0.788																					
8																									
9	Output Vectors From Disk	x	y	z																					
10	First Mirror Reflected Directions	0.441	0.235	0.866																					
11	Second Mirror Reflected Directions	0.380	0.673	-0.635																					
12	Third Mirror Reflected Directions	-0.998	0.000	-0.087																					
13		-0.589	-0.553	0.589																					
14																									
15																									
16		1	2.550	1.630	2.650																				
17		2	4.150	2.267	2.770																				
18		3	3.950	-0.196	2.060																				
19		4	2.420	0.309	2.270																				
20		5																							
21		6																							
22		7																							
23		8																							

FIG. 6E3

Station 3

218/335

Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1										
2										
3										
4	Facet	11								
5	x	y	z							
6	-0.616	0.000	0.788							
7	End			Middle			End			
8	x	y	z	x	y	z	x	y	z	
9	0.415	0.220	0.883	0.415	0.220	0.883	0.369	0.387	0.845	
10	0.351	0.669	-0.665	0.351	0.669	-0.655	0.312	0.788	-0.530	
11	-0.985	0.012	-0.089	-0.995	0.012	-0.089	-0.988	0.153	0.007	
12	-0.562	-0.574	0.596	-0.562	-0.574	0.596	-0.550	-0.439	0.710	
13										
14	Mirror 1 Corners			Mirror 2 Corners			Mirror 3 Corners			
15	x	y	z	x	y	z	x	y	z	
16	2.550	1.630	2.650	4.000	2.630	0.049	3.746	3.750	1.000	
17	4.150	2.267	2.770	4.900	1.400	0.775	1.371	3.300	2.100	
18	3.950	-0.196	2.060	4.600	3.150	2.118	1.159	1.600	0.800	
19	2.420	0.309	2.270	3.800	3.900	1.067	2.824	2.000	0.100	
20							3.771	2.700	0.100	
21										
22										
23										
24										

FIG. 6E4

Station 3

219/335

ST3
↓

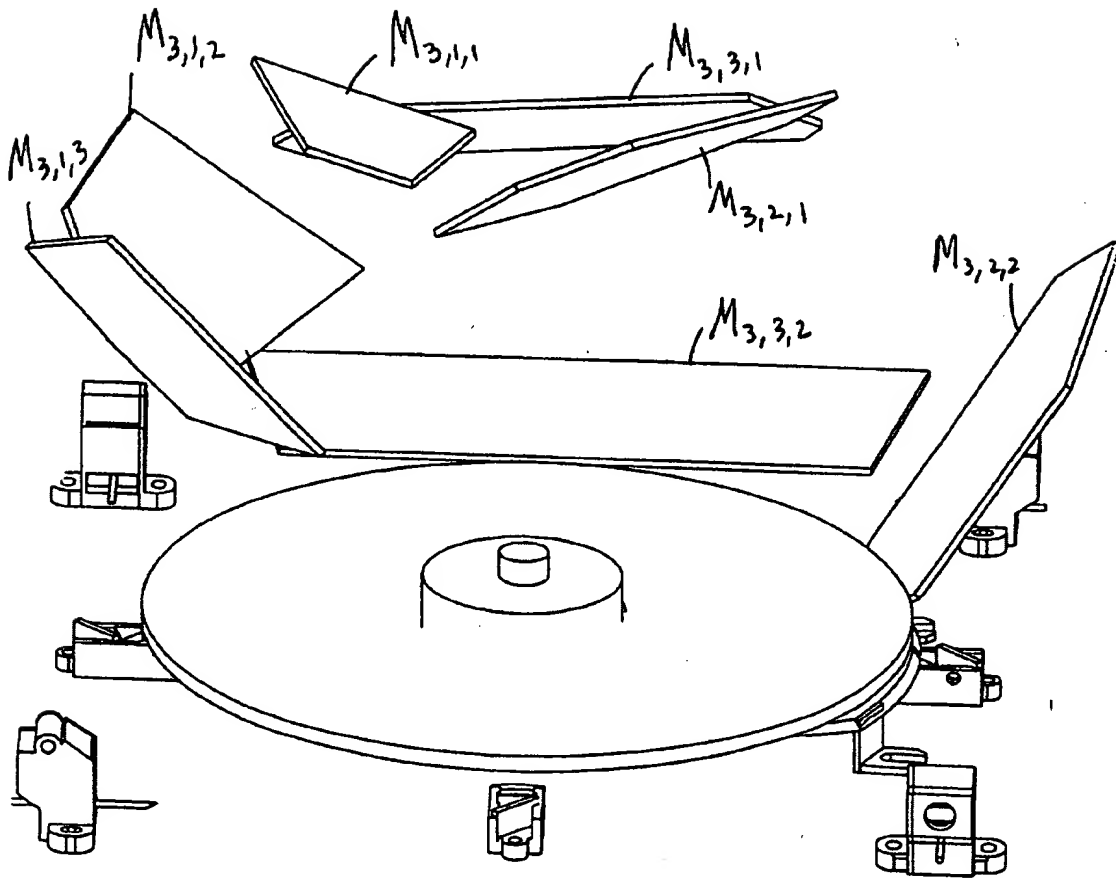


FIG. 6F1

220/335

	N	O	P	Q	R	S	T	U	V	W	X
25	Facet	8									
26	x	y	z								
27	-0.618	0.000	0.788								
28		End				Middle				End	
29	x	y	z		x	y	z		x	y	z
30	0.419	-0.416	0.807		0.468	-0.249	0.848		0.494	-0.048	0.868
31	-0.253	-0.917	-0.310		-0.316	-0.832	-0.455		-0.387	-0.704	-0.596
32	-0.468	0.414	0.781		-0.537	0.527	0.659		-0.603	0.628	0.494
33											
34											
35		Mirror 1 Corners				Mirror 2 Corners				Mirror 3 Corners	
36	x	y	z		x	y	z		x	y	z
37	3.900	-2.436	2.770		1.700	-4.102	1.300				
38	4.100	-1.879	2.400		3.300	-4.400	1.980				
39	3.800	-0.137	1.800		3.400	-3.890	1.500				
40	3.150	0.737	1.800		2.300	-2.427	-0.625				
41	2.500	0.159	2.450		1.700	-2.624	-0.625				
42	2.850	-0.757	2.770		1.050	-3.101	-0.050				
43											
44											

Fig. 6F2

Station 3

221/335

	A	B	C	D	E	F	G	H	I	J	K	L
25	High Elevation Right Skew	Facet	10									
26	(G1)	x	y	z								
27	Vector from Module	-0.616	0.000	0.788								
28			End									
29		x	y	z								
30	Output Vectors From Disk	0.378	-0.445	0.812								
31	First Mirror Reflected Directions	-0.269	-0.927	-0.263								
32	Second Mirror Reflected Directions	-0.478	0.367	0.797								
33	Third Mirror Reflected Directions											
34												
35												
36		x	y	z								
37	1	3.900	-2.436	2.770								
38	2	4.100	-1.879	2.400								
39	3	3.800	-0.137	1.800								
40	4	3.150	0.737	1.800								
41	5	2.500	0.159	2.450								
42	6	2.650	-0.757	2.770								
43	7											
44	8											

FIG. 6F3

Station 3

222/335

	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
25	Facet	12									
26	x	y	z								
27	-0.618	0.000	0.788								
28		End				Middle				End	
29	x	y	z		x	y	z		x	y	z
30	0.333	-0.476	0.814		0.415	-0.220	0.883		0.433	-0.066	0.897
31	-0.284	-0.835	-0.211		-0.382	-0.813	-0.440		-0.429	-0.728	-0.535
32	-0.487	0.316	0.814		-0.594	0.496	0.633		-0.638	0.564	0.524
33											
34											
35		Mirror 1 Corners								Mirror 3 Corners	
36	x	y	z		x	y	z		x	y	z
37	3.900	-2.436	2.770		1.700	-4.102	1.300				
38	4.100	-1.879	2.400		3.300	-4.400	1.980				
39	3.800	-0.137	1.800		3.400	-3.990	1.500				
40	3.150	0.737	1.800		2.300	-2.427	-0.825				
41	2.500	0.159	2.450		1.700	-2.624	-0.825				
42	2.650	-0.757	2.770		1.050	-3.101	-0.050				
43											
44											
45											

FIG. 6F4

Station 3

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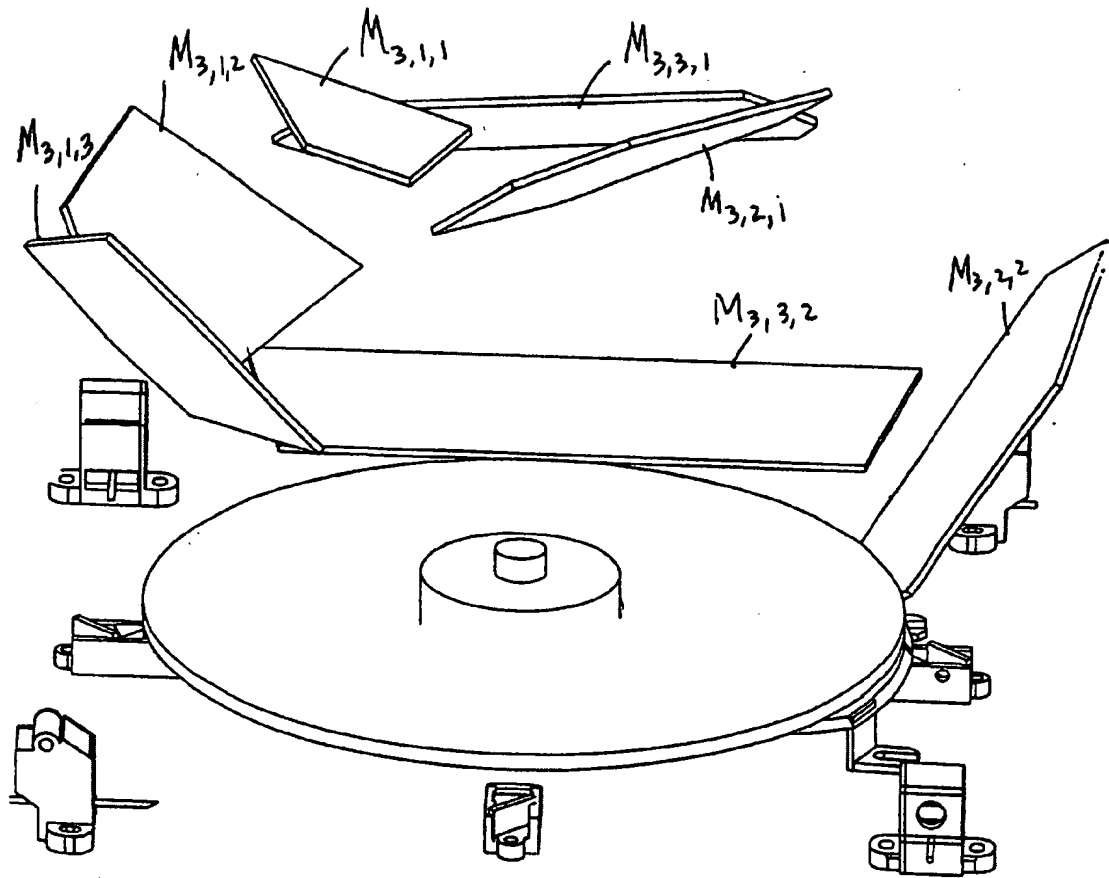


FIG. 6G1

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	N	O	P	Q	R	S	T	U	V	W	X
46	Facet	1									
47	x	y	z								
48	-0.816	0.000	0.788								
49		End									
50	x	y	z								
51	0.753	-0.321	0.575								
52	-0.368	-0.443	-0.819								
53	-0.574	-0.468	0.672								
54											
55											
56											
57	x	y	z								
58	4.250	-1.500	2.547								
59	4.950	-2.000	2.029								
60	5.150	-1.800	1.851								
61	5.000	1.800	1.656								
62	4.750	1.950	1.944								
63	4.100	1.500	2.405								
64											
65											

Fig. 692

Station 3

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	A	B	C	D	E	F	G	H	I	J	K	L
46	Low Elevation	Facet	2									
47	(G3)	x	y	z								
48	Vector from Module	-0.616	0.000	0.788								
49			End				Middle				End	
50		x	y	z		x	y	z		x	y	z
51	Output Vectors From Disk	0.734	-0.305	0.607		0.766	0.000	0.643		0.731	0.319	0.604
52	First Mirror Reflected Directions	-0.402	-0.429	-0.809		-0.456	-0.133	-0.880		-0.453	0.190	-0.871
53	Second Mirror Reflected Directions	-0.607	-0.454	0.663		-0.679	-0.161	0.716		-0.675	0.162	0.719
54	Third Mirror Reflected Directions											
55												
56												
57												
58		1	4.250	-1.500	2.547		3.150	-2.450	0.030			
59		2	4.950	-2.000	2.029		4.500	-2.800	0.213			
60		3	5.150	-1.800	1.851		4.350	-2.200	0.277			
61		4	5.000	1.800	1.658		3.050	1.850	0.089			
62		5	4.750	1.950	1.844							
63		6	4.100	1.500	2.405							
64		7										
65		8										
66												

Fig. 643

Station 3

Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
46 Facet	3									
47 x	y	z								
48 -0.816	0.000	0.788								
49	End				Middle				End	
50 x	y	z		x	y	z		x	y	z
51 0.714	-0.290	0.638		0.743	0.000	0.669		0.709	0.311	0.633
52 -0.438	-0.416	-0.797		-0.487	-0.134	-0.863		-0.485	0.181	-0.855
53 -0.638	-0.440	0.632		-0.704	-0.161	0.692		-0.702	0.155	0.695
54										
55										
56	Mirror 1 Corners				Mirror 2 Corners				Mirror 3 Corners	
57 x	y	z		x	y	z		x	y	z
58 4.250	-1.500	2.547		3.150	-2.450	0.030				
59 4.950	-2.000	2.029		4.500	-2.800	0.213				
60 5.150	-1.800	1.851		4.350	2.200	0.277				
61 5.000	1.800	1.656		3.050	1.850	0.089				
62 4.750	1.950	1.944								
63 4.100	1.500	2.405								
64										
65										

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FIG. 6G4

Station 3

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	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
46	Facet	4									
47	x	y	z								
48	-0.616	0.000	0.788								
49		End				Middle				End	
50	x	y	z		x	y	z		x	y	z
51	0.692	-0.275	0.667		0.719	0.000	0.695		0.686	0.307	0.660
52	-0.472	-0.402	-0.784		-0.517	-0.135	-0.846		-0.518	0.176	-0.838
53	-0.667	-0.426	0.611		-0.728	-0.161	0.666		-0.727	0.151	0.670
54											
55											
56											
57		Mirror 1 Corners				Mirror 2 Corners				Mirror 3 Corners	
58	x	y	z		x	y	z		x	y	z
59	4.250	-1.500	2.547		3.150	-2.450	0.030				
60	4.950	-2.000	2.029		4.500	-2.800	0.213				
61	5.150	-1.800	1.851		4.350	2.200	0.277				
62	5.000	1.800	1.656		3.050	1.850	0.089				
63	4.750	1.850	1.844								
64	4.100	1.500	2.405								
65											

Fig. 64-5

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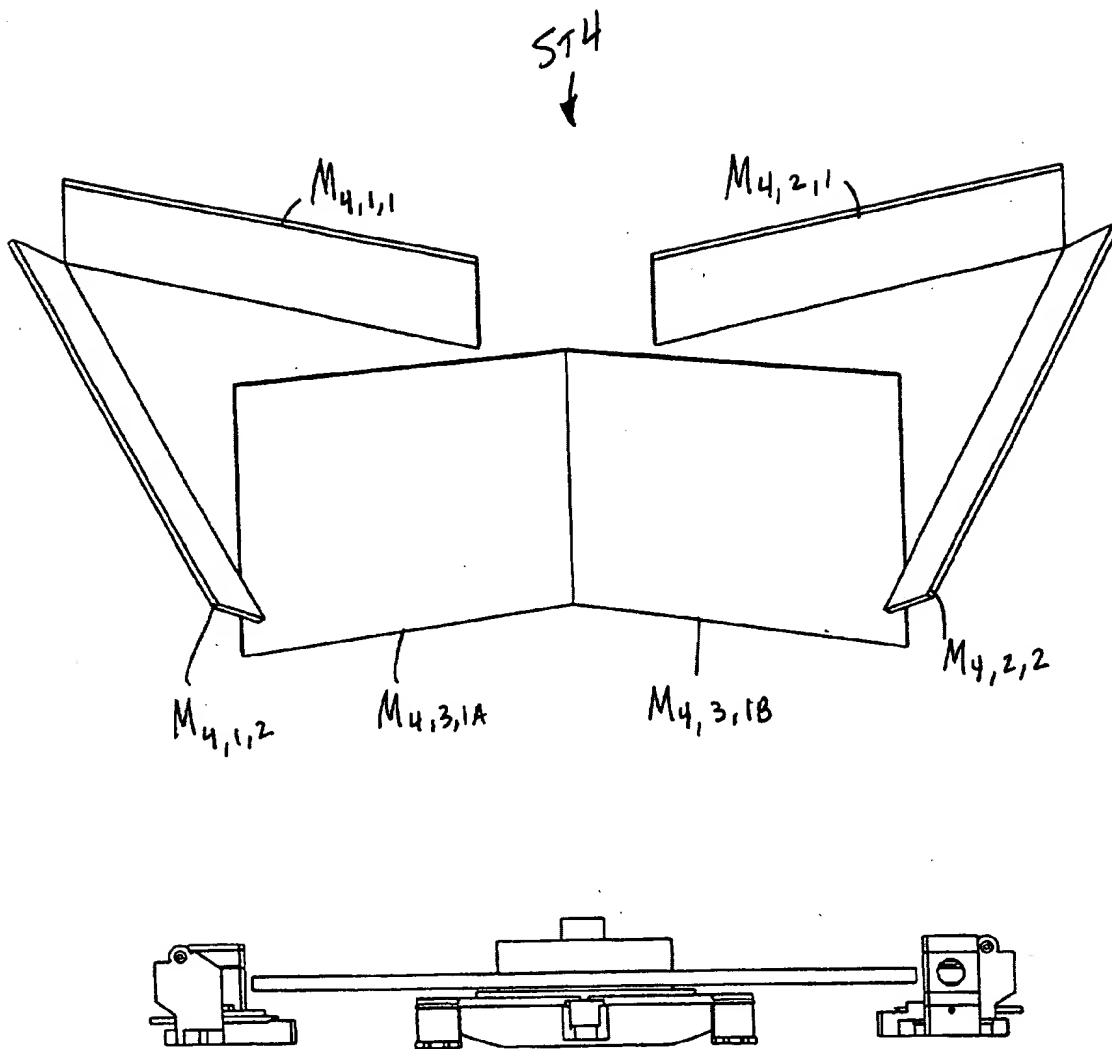


FIG. 6H1

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	A	B	C	D	E	F	G	H	I	J	K	L
1	Station 4											
2												
3												
4	High Elevation Left Skew	Facet	9									
5		x	y	z								
6	Vector from Module	-0.616	0.000	0.788								
7		End			Middle			End				
8		x	y	z		x	y	z		x	y	z
9	Output Vectors From Disk	0.366	0.474	0.801		0.441	0.235	0.866		0.452	0.177	0.874
10	First Mirror Reflected Directions	-0.488	0.739	-0.494		-0.525	0.546	-0.653		-0.638	0.496	-0.681
11	Second Mirror Reflected Directions	-0.755	-0.556	0.348		-0.789	-0.606	0.096		-0.792	-0.610	0.037
12	Third Mirror Reflected Directions											
13		Mirror 1 Corners			Mirror 2 Corners			Mirror 3 Corners				
14		x	y	z		x	y	z		x	y	z
15	1	4.900	0.800	6.409		2.850	3.200	3.370				
16	2	6.100	0.800	5.845		4.200	2.800	3.231				
17	3	6.000	4.500	6.468		5.950	4.500	6.464				
18	4	4.800	4.500	7.168		4.600	4.950	6.680				
19	5											
20	6											
21	7											
22												

FIG. 6H3

Station 4

[illegible]

FIG. 6H4

Station 4

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ST4

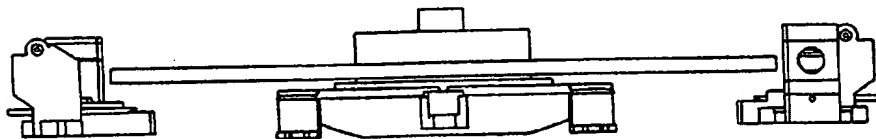
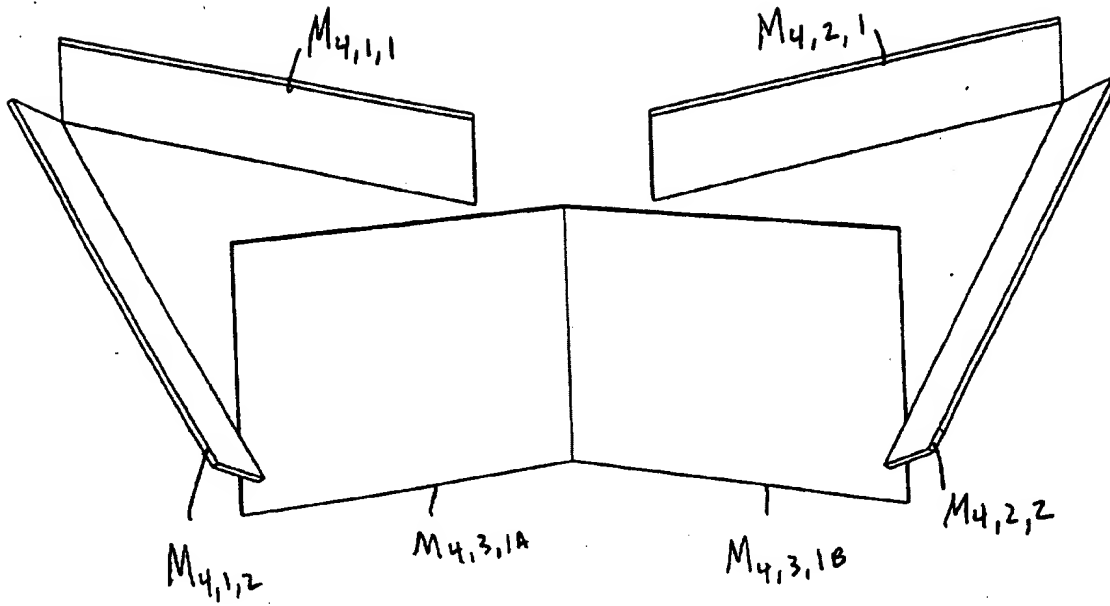


FIG. 6I1

$$233/335$$
[illegible]

FIG. 6F2

	A	B	C	D	E	F	G	H	I	J	K	L
25	High Elevation Right Skew	Facel	10									
26		x	y	z								
27	Vector from Module	-0.616	0.000	0.788								
28			End									
29		x	y	z								
30	Output Vectors From Disk	0.452	-0.177	0.874								
31	First Mirror Reflected Directions	-0.538	-0.496	-0.681								
32	Second Mirror Reflected Directions	-0.792	0.610	0.037								
33	Third Mirror Reflected Directions											
34												
35												
36		x	y	z								
37	1	4.900	-0.800	6.409								
38	2	6.100	-0.800	5.645								
39	3	6.000	-4.500	6.468								
40	4	4.900	-4.500	7.168								
41	5											
42	6											
43	7											
44	8											

FIG. 6I3

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	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
25	Facet	12									
26	x	y	z								
27	-0.616	0.000	0.788								
28		End									
29	x	y	z								
30	0.422	-0.176	0.889								
31	-0.564	-0.494	-0.661								
32	-0.811	0.583	0.039								
33											
34											
35											
36											
37	4.900	-0.800	6.409								
38	6.100	-0.800	5.645								
39	6.000	-4.500	6.468								
40	4.900	-4.500	7.168								
41											
42											
43											
44											

FIG. 6I4

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335

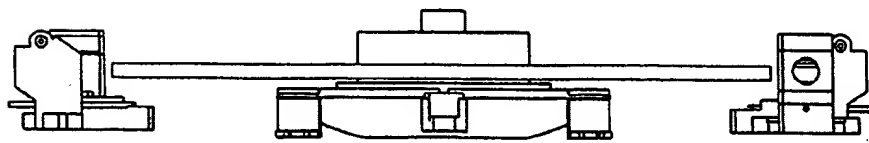
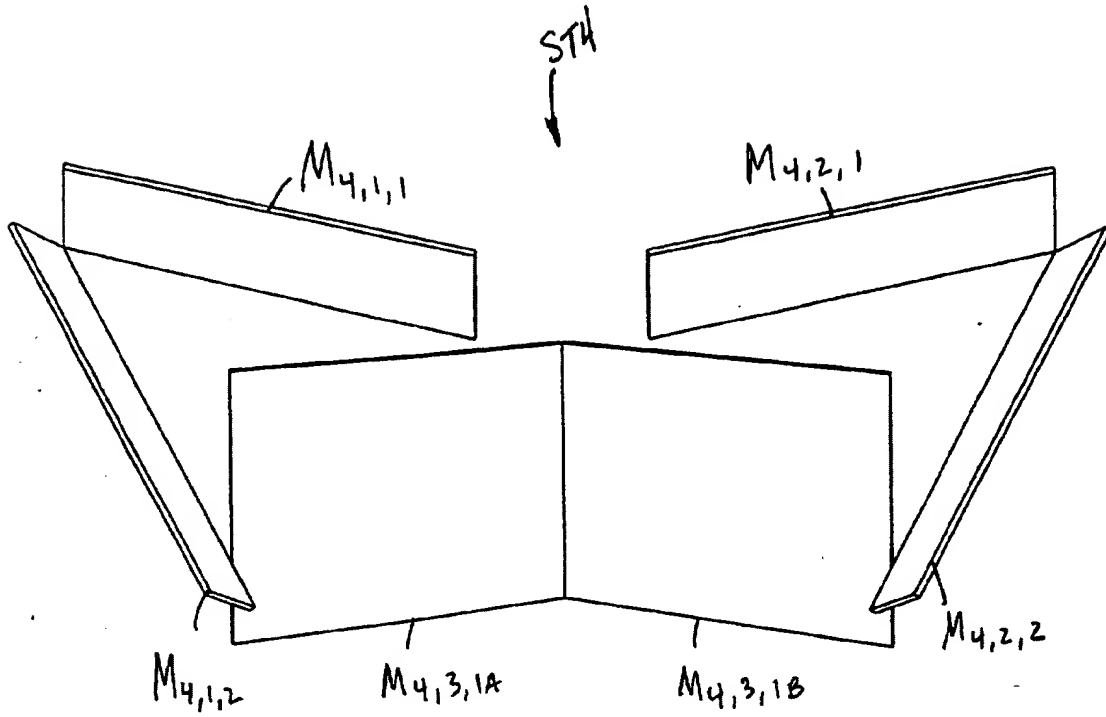


FIG. 6J1

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335

	N	O	P	Q	R	S	T	U	V	W	X
46	Facet	1									
47	x	y	z								
48	-0.816	0.000	0.788								
49		End									
50	x	y	z								
51	0.788	0.001	0.616								
52	-0.938	0.335	0.087								
53											
54											
55											
56		Mirror 1 Corners									
57	x	y	z								
58	6.700	0.000	5.608								
59	7.400	0.000	3.322								
60	6.950	-3.000	2.897								
61	6.200	-3.000	5.345								
62											
63											
64											
65											
66											

FIG. 6J2

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	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
46	Facet	2									
47	x	y	z								
48	-0.616	0.000	0.788								
49		End									
50	x	y	z								
51	0.766	0.000	0.843								
52	-0.836	0.329	0.121								
53											
54											
55											
56		Mirror 1 Corners									
57	x	y	z								
58	6.700	0.000	5.608								
59	7.400	0.000	3.322								
60	6.950	-3.000	2.897								
61	6.200	-3.000	5.345								
62											
63											
64											
65											
66											

FIG. 6J3

Station 4

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	A	B	C	D	E	F	G	H	I	J	K	L
46	Low Elevation	Facet	3									
47		x	y	z								
48	Vector from Module	-0.616	0.000	0.788								
49			End				Middle				End	
50		x	y	z		x	y	z		x	y	z
51	Output Vectors From Disk	0.743	0.000	0.669		0.743	0.000	0.669		0.697	-0.362	0.819
52	First Mirror Reflected Directions	-0.933	0.324	0.156		-0.933	0.324	0.156		-0.984	-0.035	0.101
53	Second Mirror Reflected Directions											
54	Third Mirror Reflected Directions											
55												
56			Mirror 1 Corners				Mirror 2 Corners				Mirror 3 Corners	
57		x	y	z		x	y	z		x	y	z
58	1	6.700	0.000	5.608								
59	2	7.400	0.000	3.322								
60	3	6.950	-3.000	2.897								
61	4	6.200	-3.000	5.345								
62	5											
63	6											
64	7											
65	8											
66												

FIG. 6J4

Station 4

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	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
46	Facet	4									
47	x	y	z								
48	-0.616	0.000	0.788								
49		End									
50	x	y	z								
51	0.719	0.000	0.695								
52	-0.929	0.319	0.190								
53											
54											
55											
56		Mirror 1 Corners									
57	x	y	z								
58	6.700	0.000	5.608								
59	7.400	0.000	3.322								
60	6.950	-3.000	2.897								
61	6.200	-3.000	5.345								
62											
63											
64											
65											
66											

FIG. 6J5

Station 4

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	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH
46	Facet	5									
47	x	y	z								
48	-0.616	0.000	0.788								
49											
50	x	y	z								
51	0.669	0.000	0.743								
52	-0.916	0.307	0.257								
53											
54											
55											
56											
57	x	y	z								
58	6.700	0.000	5.608								
59	7.400	0.000	3.322								
60	6.950	-3.000	2.897								
61	6.200	-3.000	5.345								
62											
63											
64											
65											

FIG. 6J6

Station 4

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	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU
46	Facet	6										
47	x	y	z									
48	-0.616	0.000	0.788									
49		End								End		
50	x	y	z									
51	0.616	0.000	0.788									
52	-0.900	0.293	0.324									
53												
54												
55												
56		Mirror 1 Corners										
57	x	y	z									
58	6.700	0.000	5.608									
59	7.400	0.000	3.322									
60	6.950	-3.000	2.897									
61	6.200	-3.000	5.345									
62												
63												
64												
65												

FIG. 6J7

Station 4

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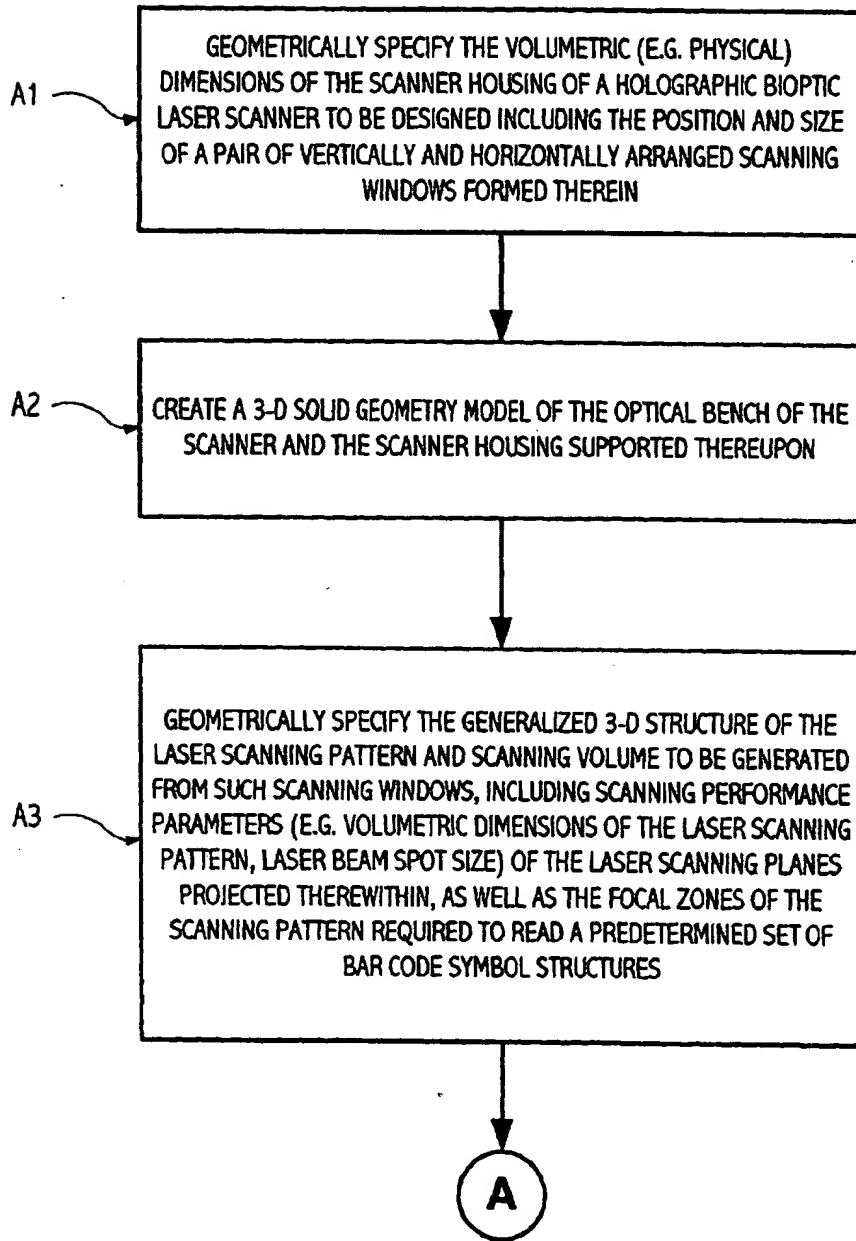


FIG. 7A

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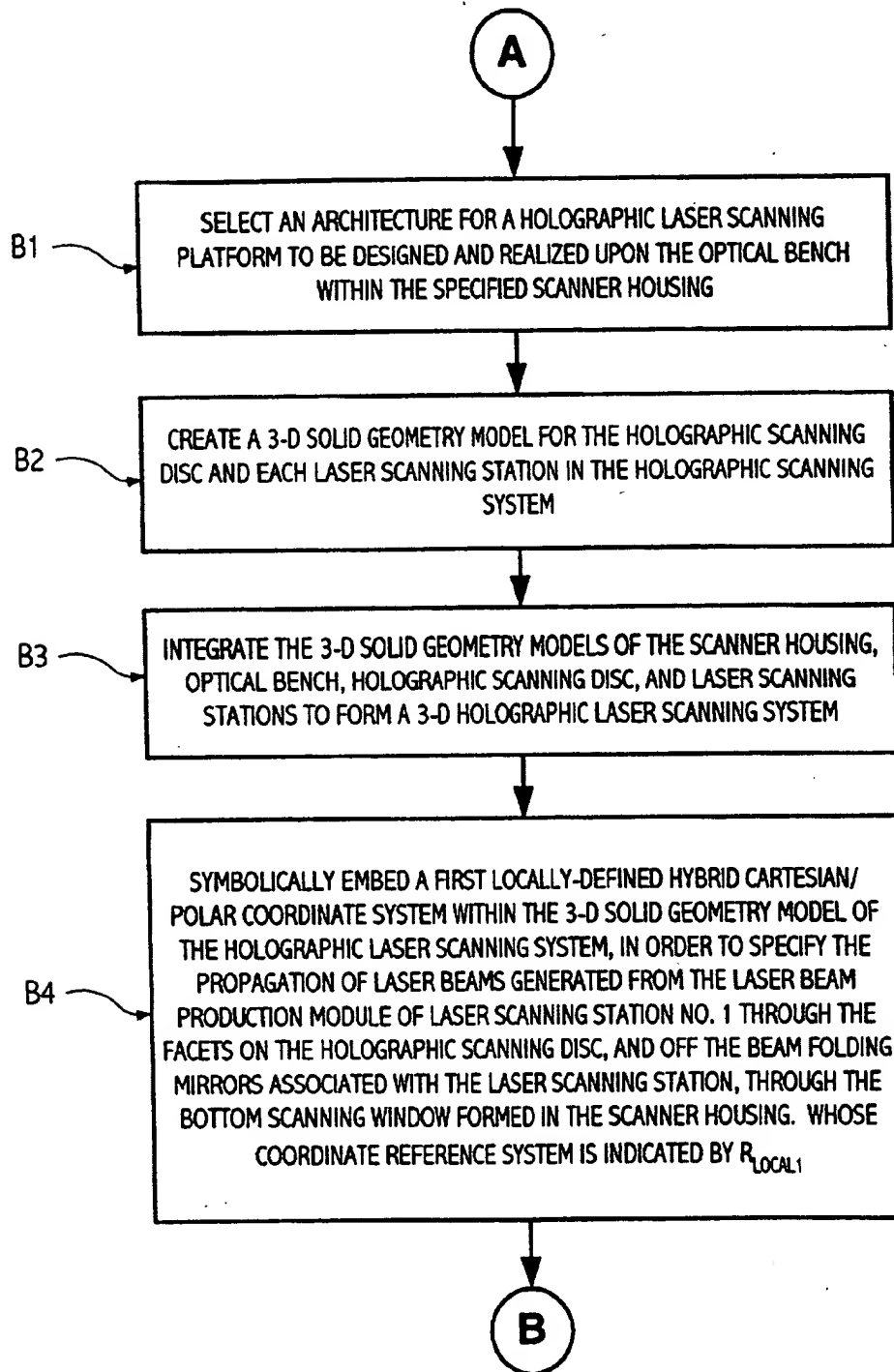


FIG. 7B

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B

B5

SYMBOLICALLY EMBED A SECOND LOCALLY-DEFINED HYBRID CARTESIAN/
POLAR COORDINATE SYSTEM WITHIN THE 3-D SOLID GEOMETRY MODEL OF
THE HOLOGRAPHIC LASER SCANNING SYSTEM, IN ORDER TO SPECIFY THE
PROPAGATION OF LASER BEAMS GENERATED FROM THE LASER BEAM
PRODUCTION MODULE OF LASER SCANNING STATION NO. 2 THROUGH THE
FACETS ON THE HOLOGRAPHIC SCANNING DISC, AND OFF THE BEAM FOLDING
MIRRORS ASSOCIATED WITH THE LASER SCANNING STATION, THROUGH THE
BOTTOM SCANNING WINDOW FORMED IN THE SCANNER HOUSING. WHOSE
COORDINATE REFERENCE SYSTEM IS INDICATED BY R_{LOCAL2}

B6

SYMBOLICALLY EMBED A THIRD LOCALLY-DEFINED HYBRID CARTESIAN/POLAR
COORDINATE SYSTEM WITHIN THE 3-D SOLID GEOMETRY MODEL OF THE
HOLOGRAPHIC LASER SCANNING SYSTEM, IN ORDER TO SPECIFY THE
PROPAGATION OF LASER BEAMS GENERATED FROM THE LASER BEAM
PRODUCTION MODULE OF LASER SCANNING STATION NO. 3 THROUGH THE
FACETS ON THE HOLOGRAPHIC SCANNING DISC, AND OFF THE BEAM FOLDING
MIRRORS ASSOCIATED WITH THE LASER SCANNING STATION, THROUGH THE
SIDE SCANNING WINDOW FORMED IN THE SCANNER HOUSING. WHOSE
COORDINATE REFERENCE SYSTEM IS INDICATED BY R_{LOCAL3}

B7

SYMBOLICALLY EMBED A FOURTH LOCALLY-DEFINED HYBRID CARTESIAN/
POLAR COORDINATE SYSTEM WITHIN THE 3-D SOLID GEOMETRY MODEL OF
THE HOLOGRAPHIC LASER SCANNING SYSTEM, IN ORDER TO SPECIFY THE
PROPAGATION OF LASER BEAMS GENERATED FROM THE LASER BEAM
PRODUCTION MODULE OF LASER SCANNING STATION NO. 4 THROUGH THE
FACETS ON THE HOLOGRAPHIC SCANNING DISC, AND OFF THE BEAM FOLDING
MIRRORS ASSOCIATED WITH THE LASER SCANNING STATION, THROUGH THE
SIDE SCANNING WINDOW FORMED IN THE SCANNER HOUSING. WHOSE
COORDINATE REFERENCE SYSTEM IS INDICATED BY R_{LOCAL4}

C

FIG. 7C

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C

B8

SYMBOLICALLY EMBED A GLOBALLY-DEFINED HYBRID CARTESIAN/POLAR COORDINATE SYSTEM WITHIN THE 3-D SOLID GEOMETRY MODEL OF THE HOLOGRAPHIC LASER SCANNING SYSTEM, IN ORDER TO SPECIFY THE PROPAGATION OF LASER BEAMS GENERATED FROM LASER SCANNING STATION NOS. 1, 2, 3, AND 4 RELATIVE TO A GLOBALLY-BASED COORDINATE REFERENCE SYSTEM R_{GLOBAL}

C1A

FOR EACH SCANNING FACET PASSING THROUGH EACH LASER SCANNING STATION IN THE HOLOGRAPHIC SCANNING SYSTEM, USE SPREAD-SHEET BASED MODELLING TOOLS TO CREATE A ANALYTICAL-BASED LIGHT DIFFRACTION MODEL OF THE LASER BEAM TO PROPAGATE FROM THE LASER BEAM PRODUCTION MODULE (LBPM), TOWARDS AND THROUGH EACH SCANNING FACET ON THE HOLOGRAPHIC SCANNING DISC IN THE SYSTEM (i.e. LASER SCANNING BEAM PRODUCTION MODEL) AS THE HOLOGRAPHIC SCANNING DISC ROTATES ABOUT ITS AXIS

C1B

CONVERT ANALYTICAL-BASED LIGHT DIFFRACTION MODELS CREATED IN STEP C1A INTO CORRESPONDING VECTOR-BASED LIGHT DIFFRACTION MODELS OF THE LASER BEAM DIFFRACTION PROCESSES AT THE FACETS OF THE HOLOGRAPHIC SCANNING DISC OF THE PRESENT INVENTION

D

FIG. 7D

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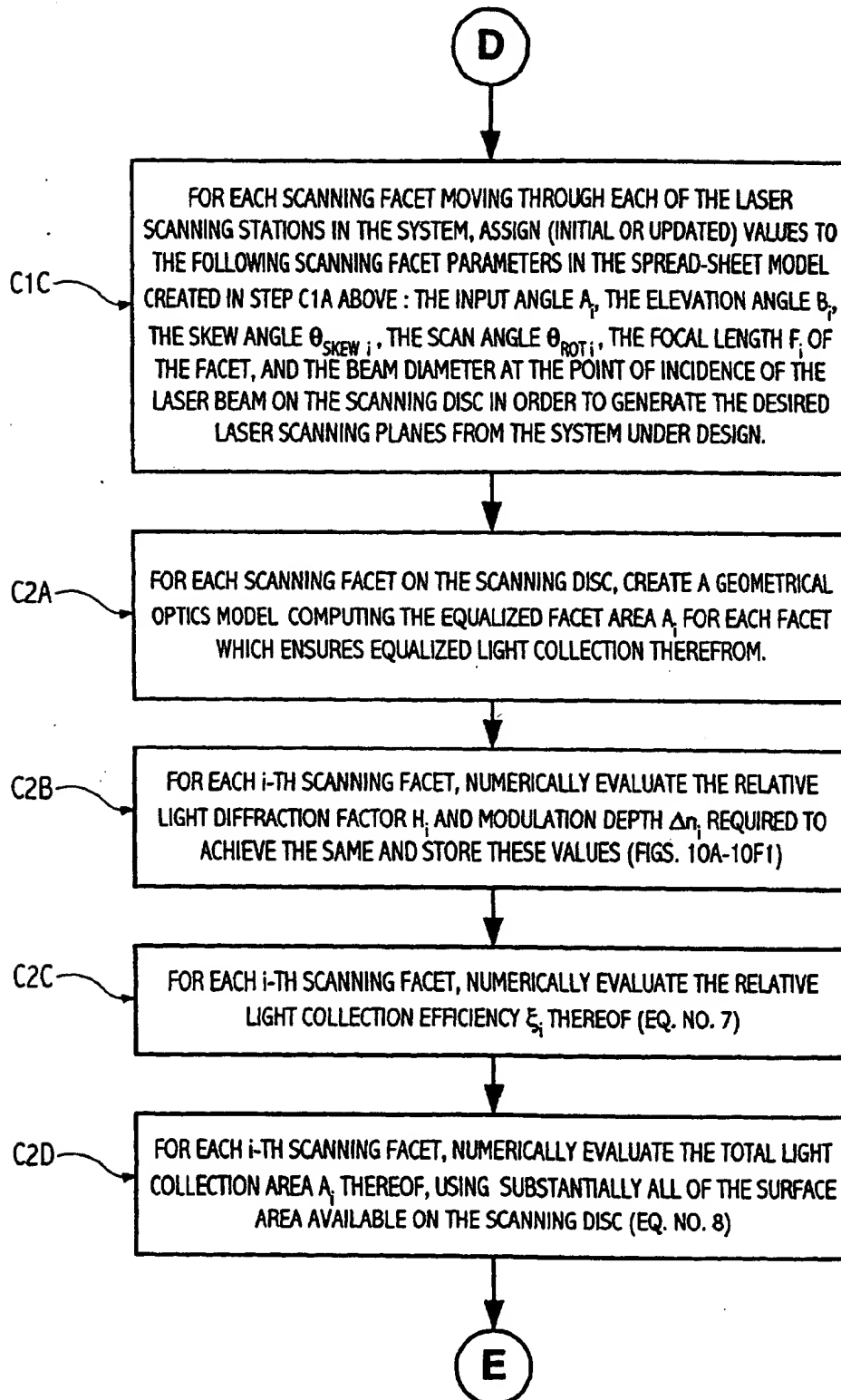


FIG. 7E

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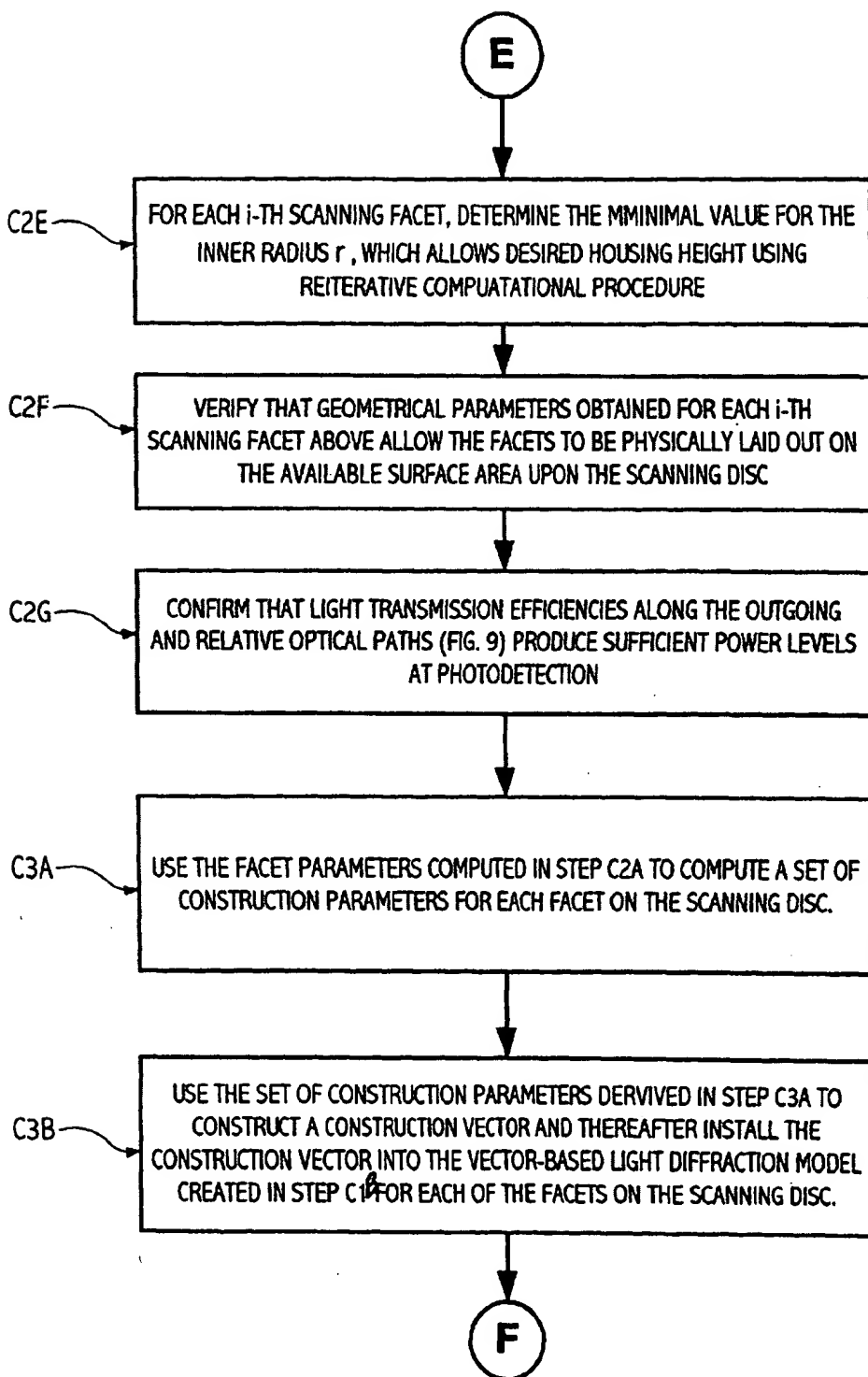


FIG. 7F

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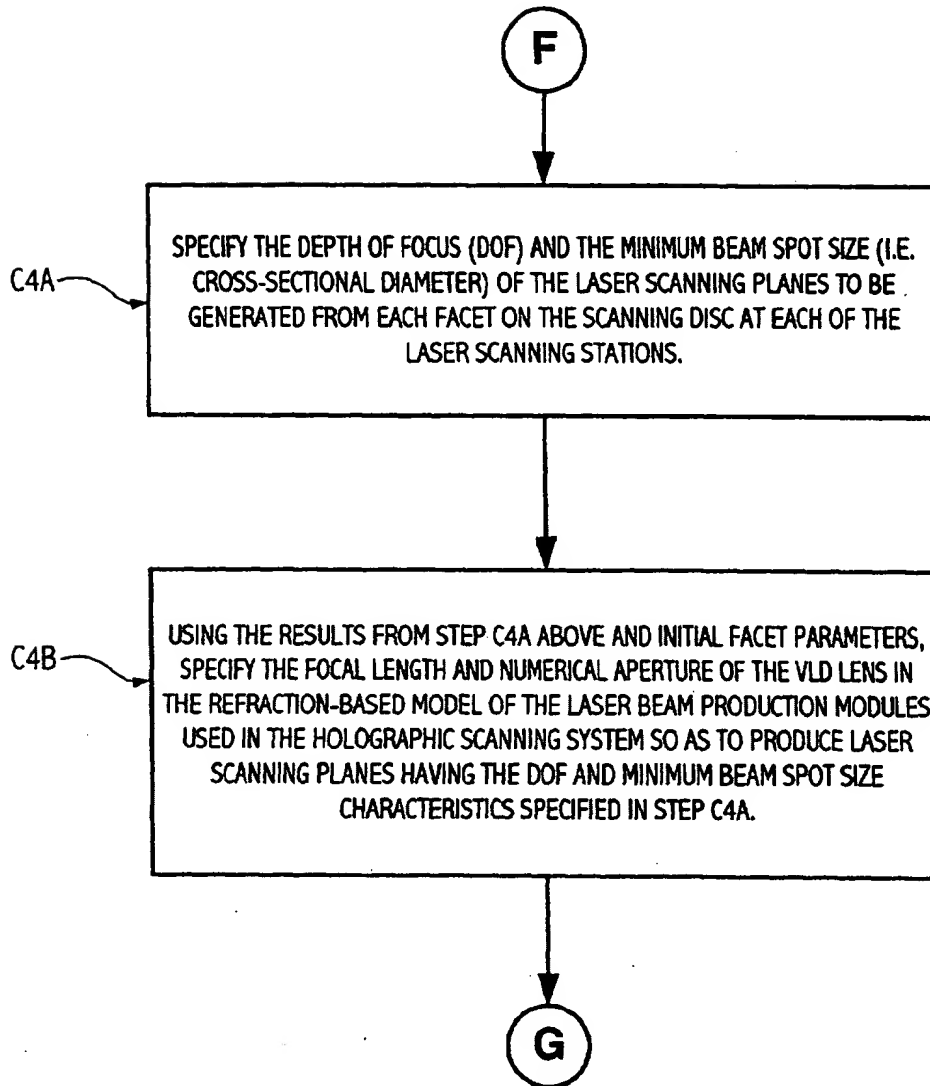


FIG. 7G

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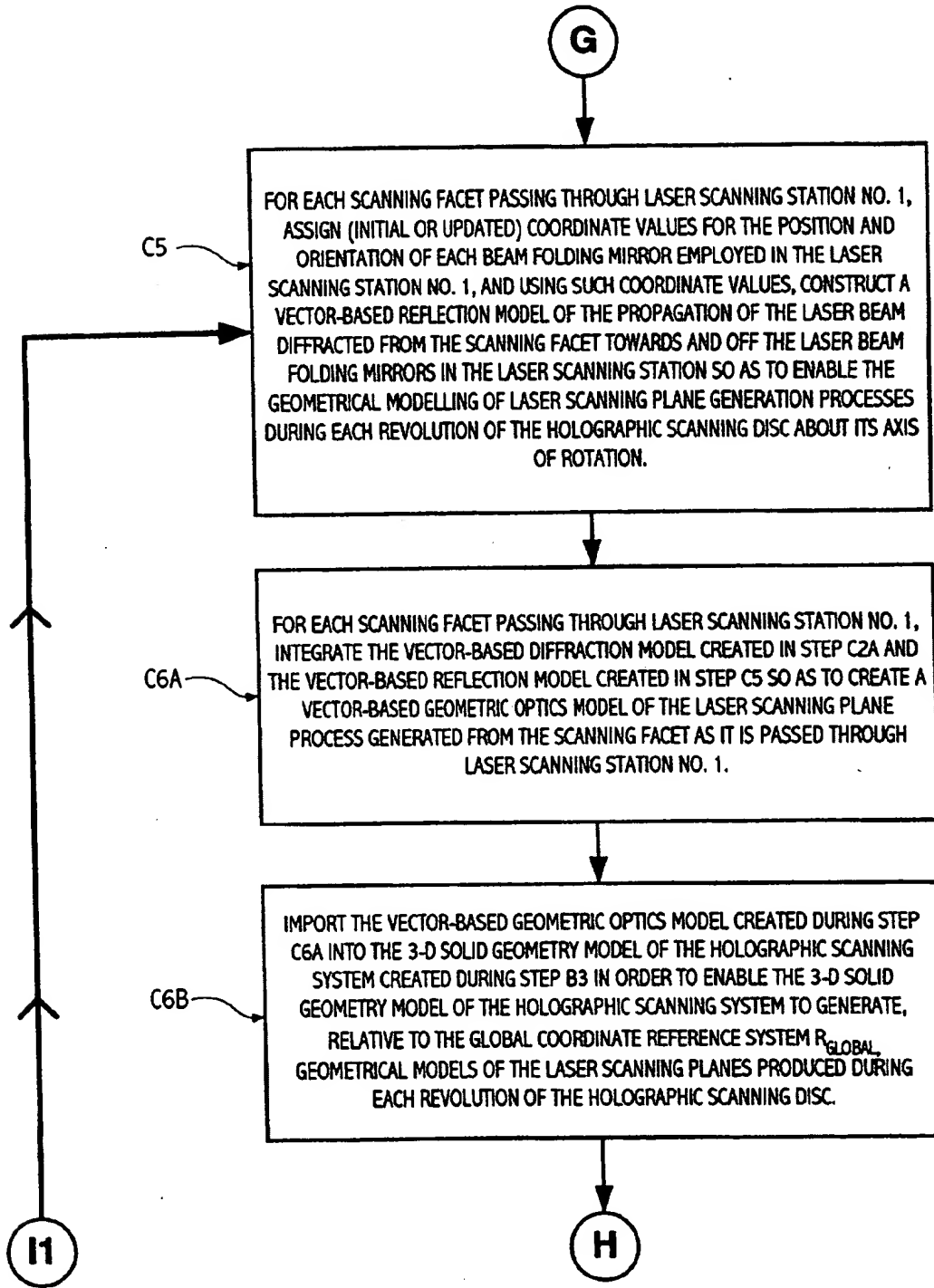


FIG. 7H

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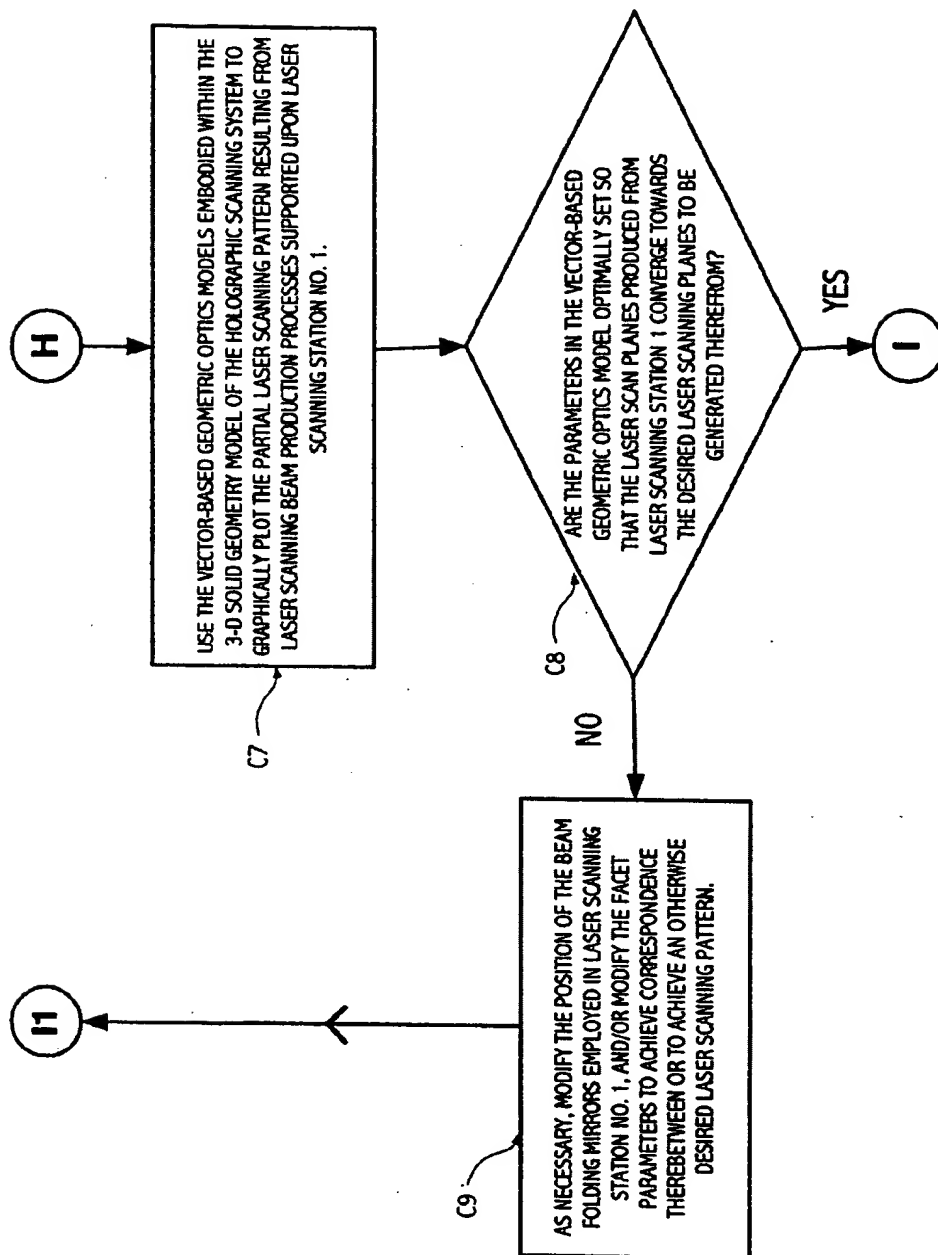


FIG. 71

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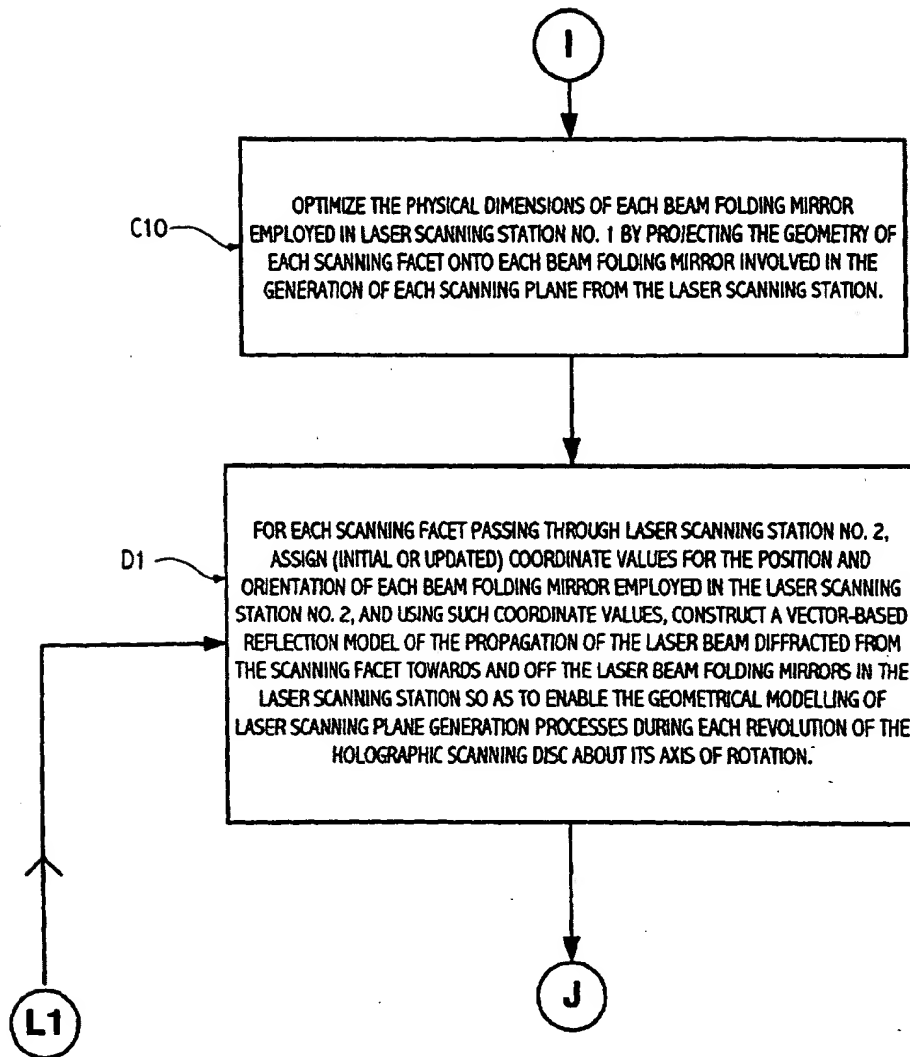


FIG. 7J

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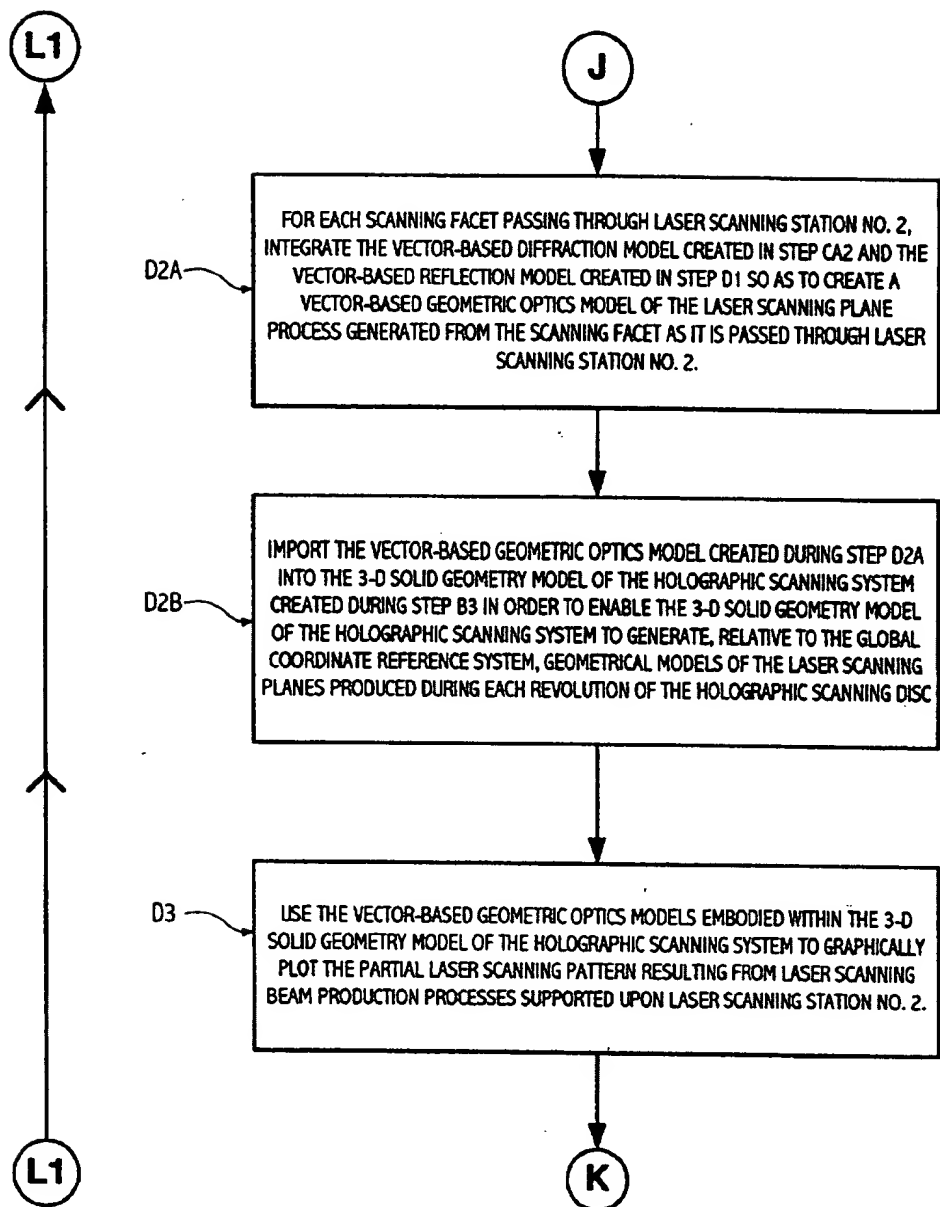


FIG. 7K

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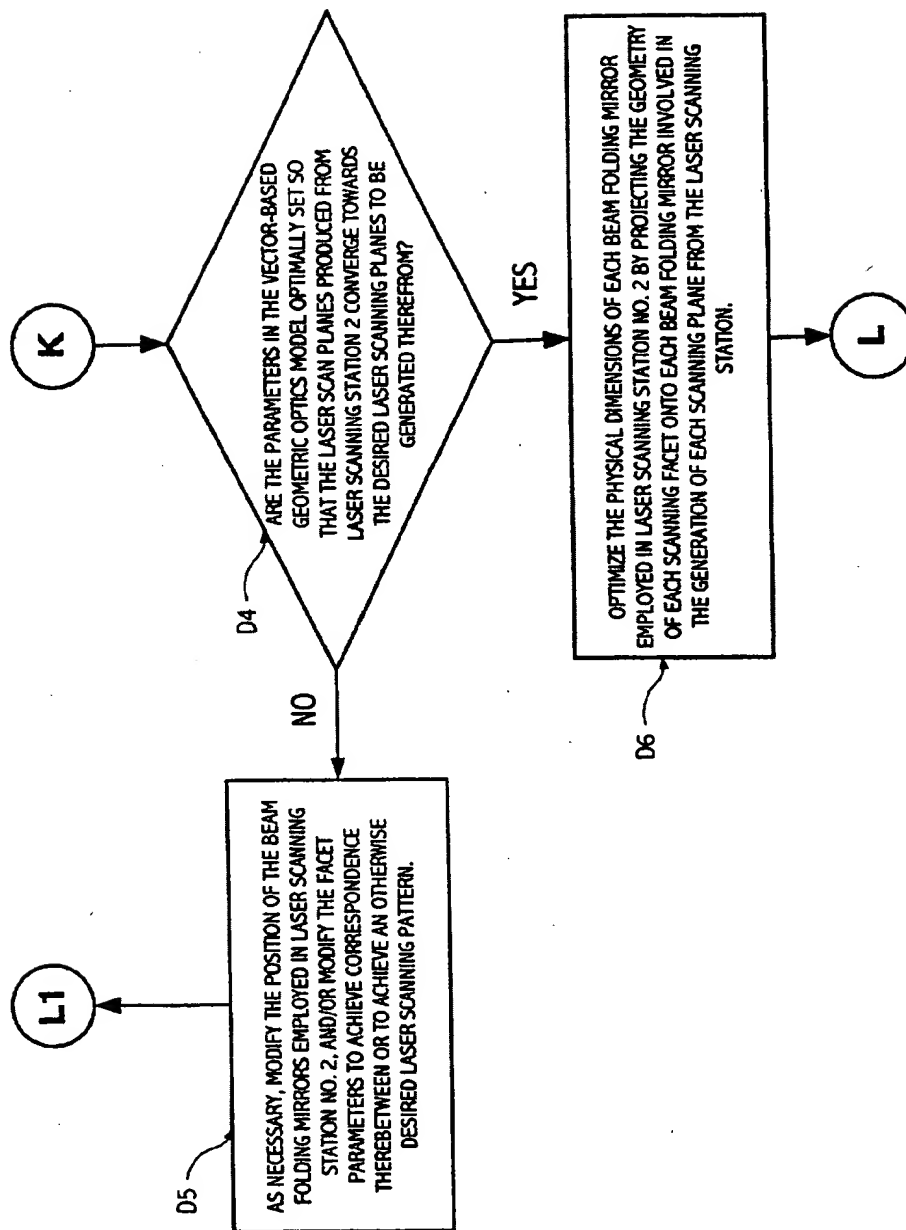


FIG. 7L

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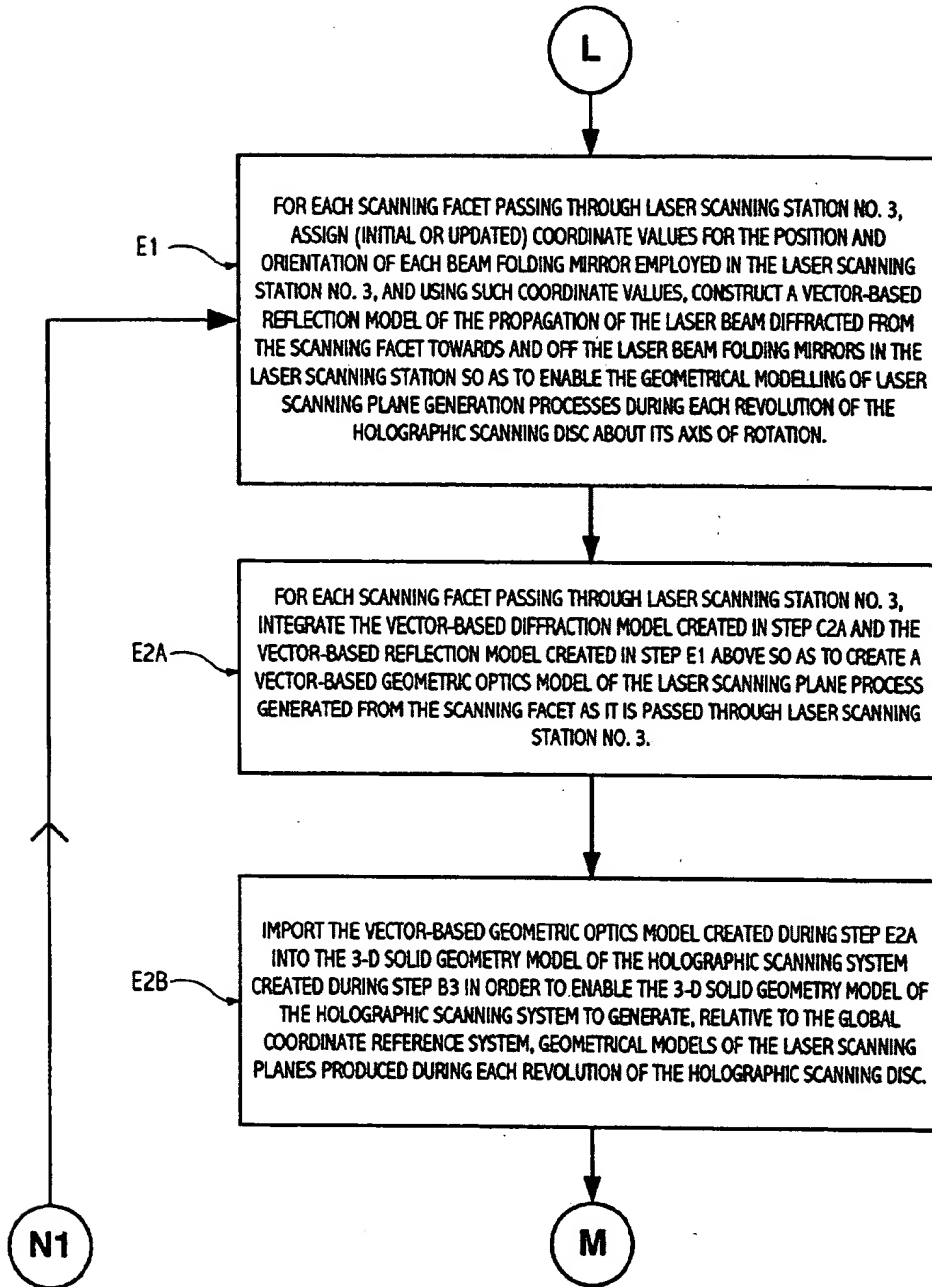


FIG. 7M

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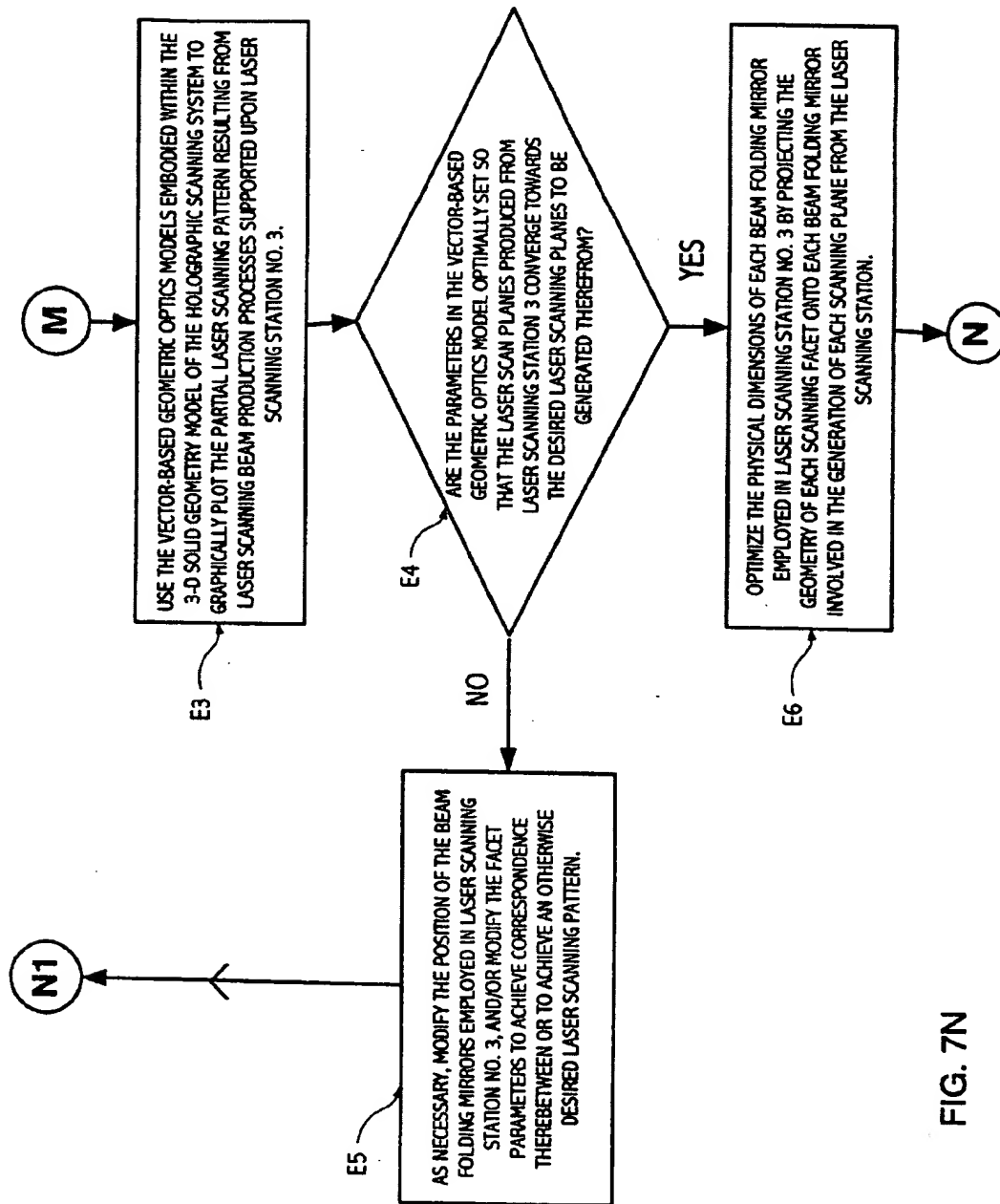


FIG. 7N

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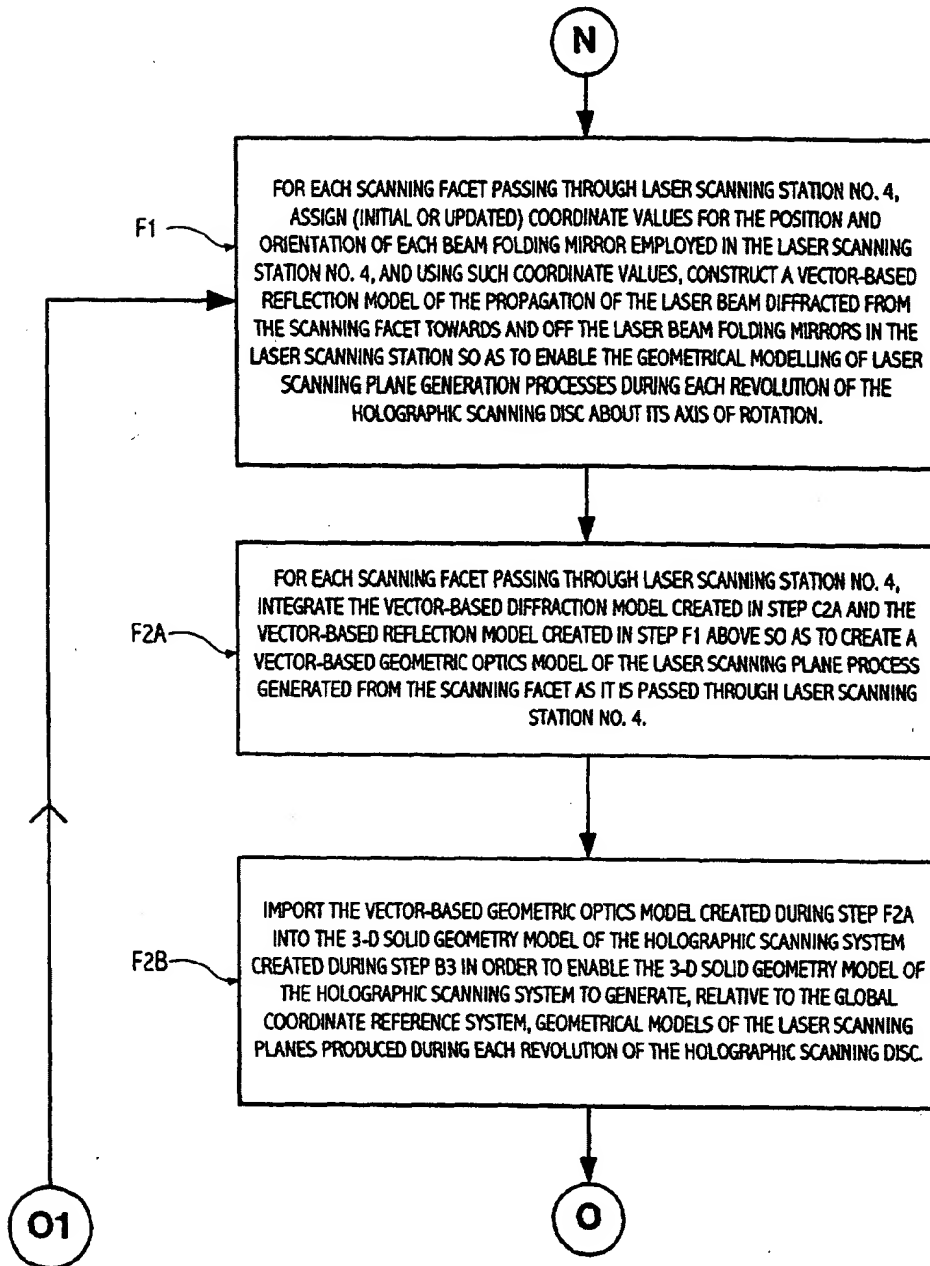


FIG. 70

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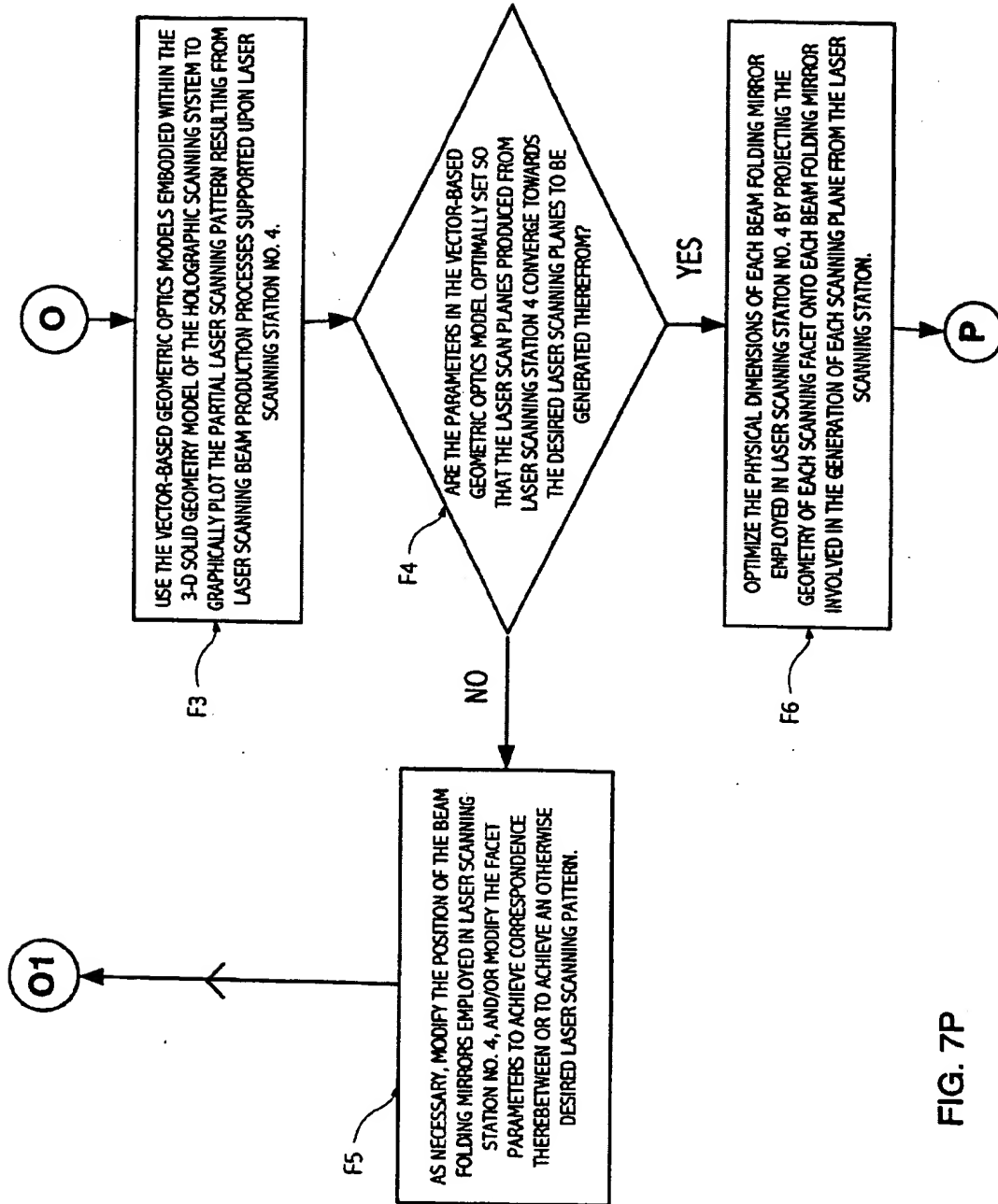


FIG. 7P

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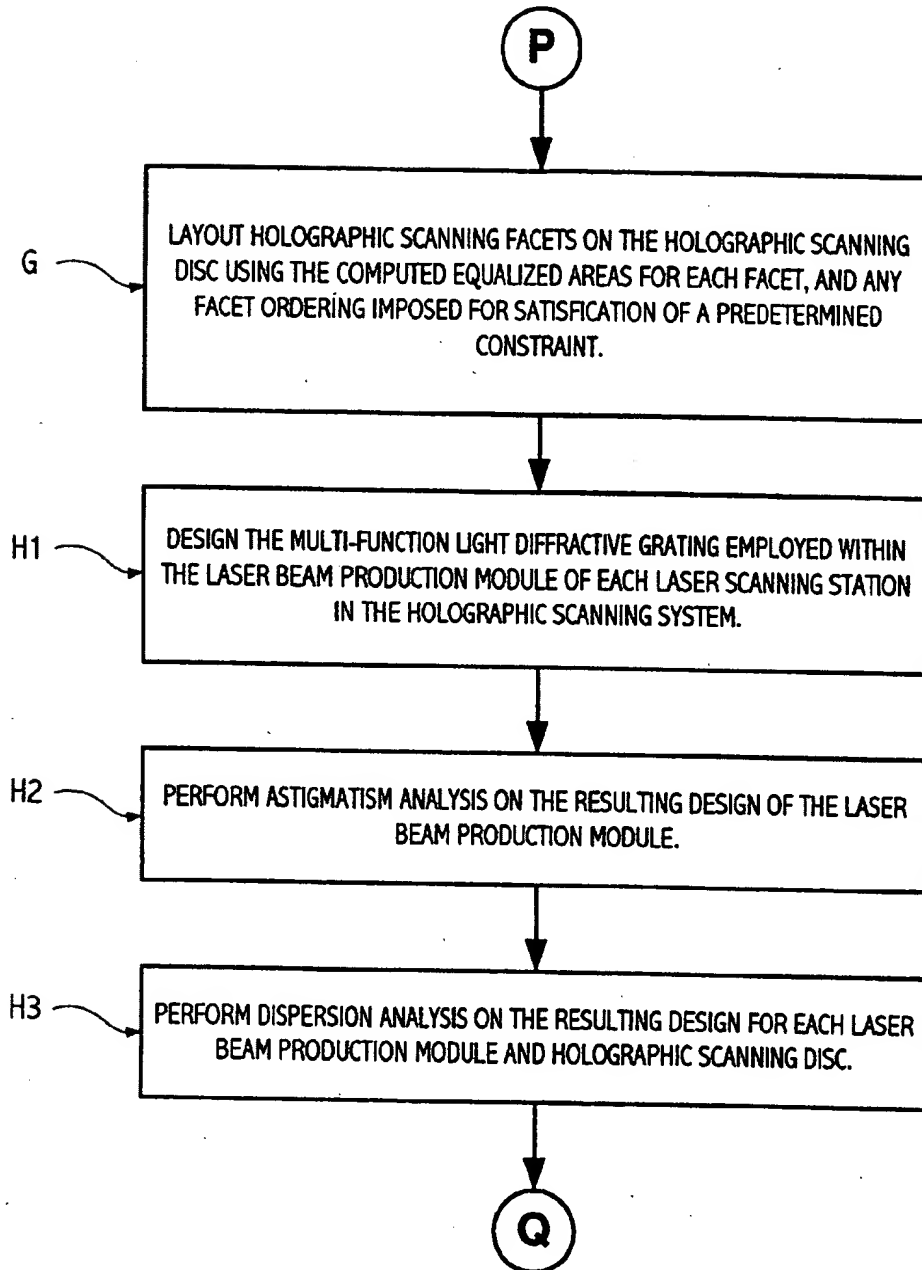


FIG. 7Q

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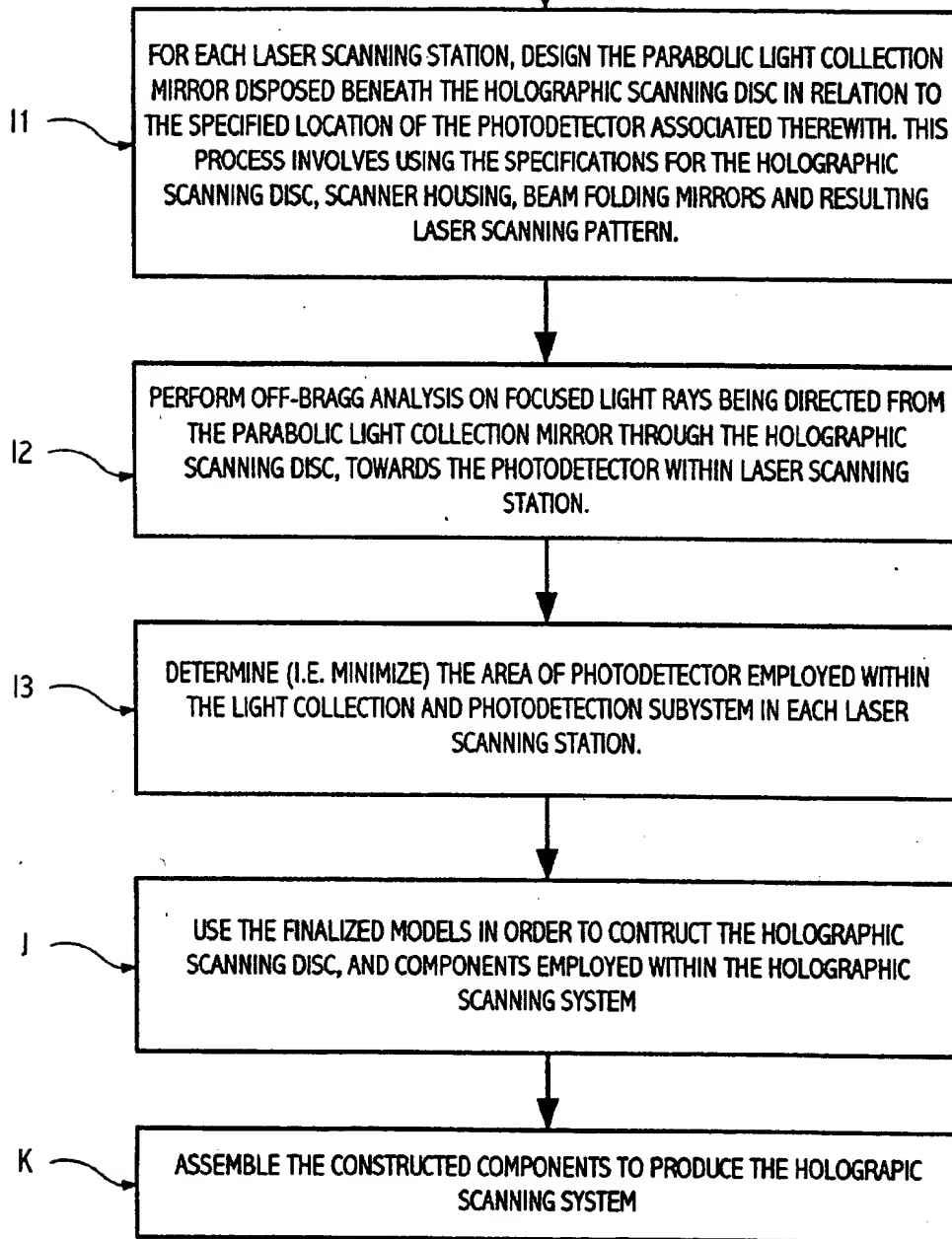


FIG. 7R

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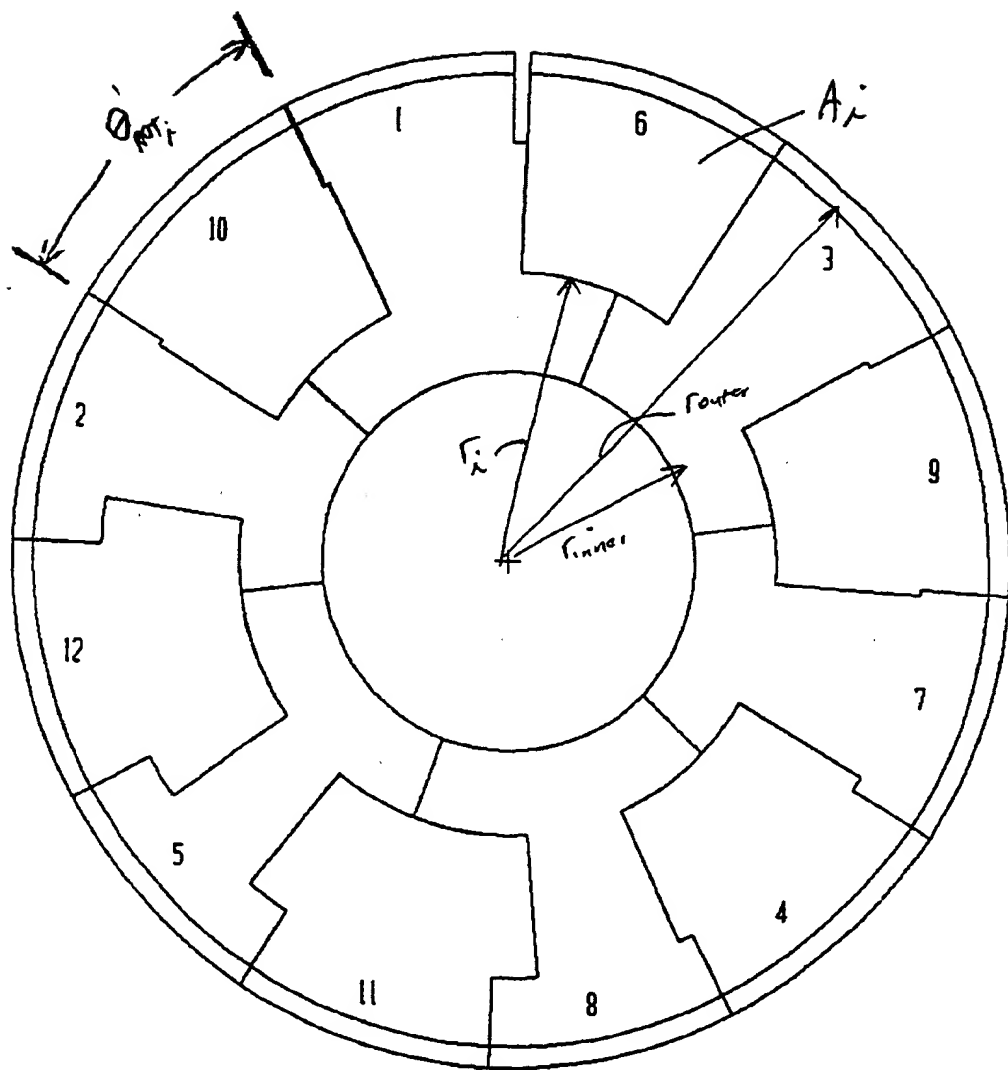


FIG. 8A

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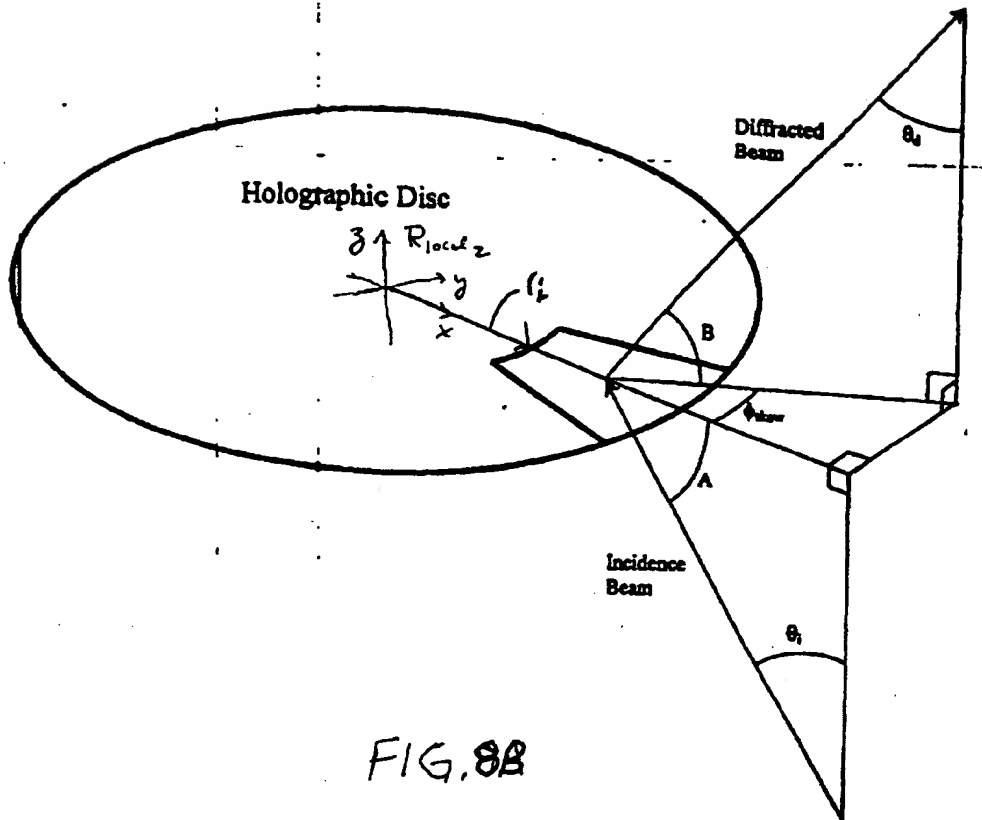


FIG. 8B

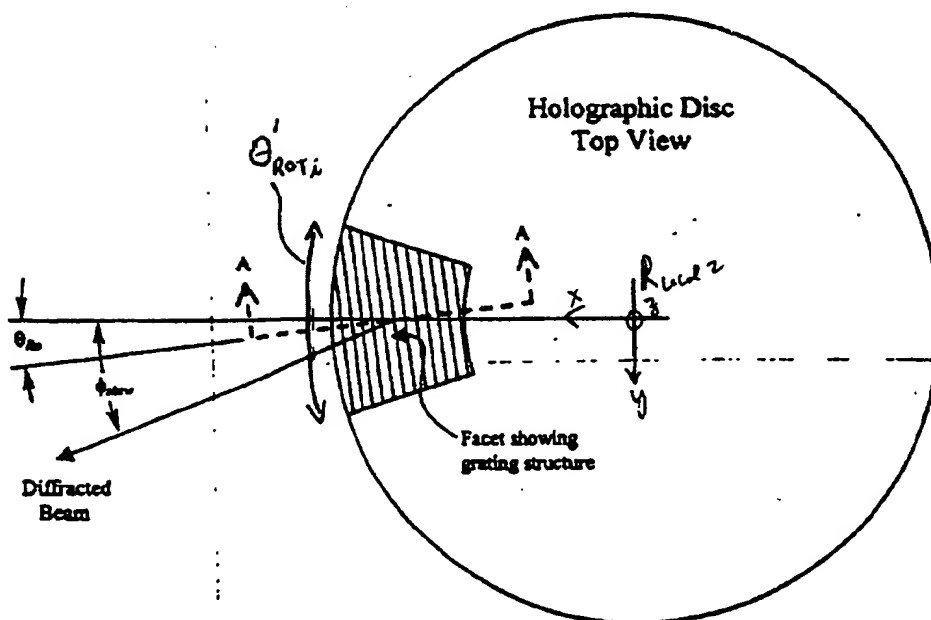


FIG. 8B

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- (1) THE RADIUS TO BEAM-INCIDENT-POINT ON THE HOLOGRAPHIC SCANNING DISC, ASSIGNED THE SYMBOLIC NOTATION " r_0 "
- (2) THE DISTANCE FROM RADIUS TO BEAM-INCIDENT-POINT r_0 TO BEAM FOLDING MIRROR, ASSIGNED THE SYMBOLIC NOTATION " L "
- (3) THE FACET NO. ON THE HOLOGRAPHIC SCANNING DISC, ASSIGNED THE SYMBOLIC NOTATION " i "
- (4) THE DISTANCE FROM THE BEAM INCIDENT POINT ON THE VIRTUAL SCANNING DISC TO THE FOCAL PLANE WITHIN WHICH THE (i, j) -TH SCANLINE RESIDES, ASSIGNED THE SYMBOLIC NOTATION " f_i "
- (5) THE DIAMETER OF THE CROSS-SECTION OF THE LASER BEAM SCANNING STATION, ASSIGNED THE SYMBOLIC NOTATION " d_{BEAM} "
- (6) THE ANGULAR GAP BETWEEN ADJACENT HOLOGRAPHIC SCANNING FACETS, ASSIGNED THE SYMBOLIC NOTATION " d_{GAP} "
- (7) THE OUTER RADIUS OF THE AVAILABLE LIGHT COLLECTION REGION ON THE HOLOGRAPHIC SCANNING DISC, ASSIGNED THE SYMBOLIC NOTATION " r_{OUTER} "
- (8) THE INNER RADIUS OF THE AVAILABLE LIGHT COLLECTION REGION ON THE HOLOGRAPHIC SCANNING FACET, ASSIGNED THE SYMBOLIC NOTATION " r_{INNER} "
- (9) THE FOCAL LENGTH OF THE i -TH HOLOGRAPHIC SCANNING FACET FROM THE SCANNING FACET TO THE CORRESPONDING FOCAL PLANE WITHIN THE SCANNING VOLUME, ASSIGNED THE SYMBOLIC NOTATION " f_i "
- (10) INCIDENT BEAM ANGLE, ASSIGNED THE SYMBOLIC NOTATION " A_i "

F I G. 8D1

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- (11) DIFFRACTED BEAM ANGLE, ASSIGNED THE SYMBOLIC NOTATION " B_i ."
- (12) THE SCAN ANGLE OF THE LASER BEAM , ASSIGNED THE SYMBOLIC NOTATION " θ_{si} ."
- (13) THE SCAN MULTIPLICATION FACTOR FOR THE i-TH HOLOGRAPHIC FACET, ASSIGNED THE SYMBOLIC NOTATION " M_i ."
- (14) THE FACET ROTATION ANGLE FOR THE i-TH HOLOGRAPHIC FACET, ASSIGNED THE SYMBOLIC NOTATION " θ_{roTi} ."
- (15) ADJUSTED FACET ROTATION ANGLE ACCOUNTING FOR DEADTIME, ASSIGNED THE SYMBOLIC NOTATION " θ'_{roTi} ."
- (16) THE LIGHT COLLECTION EFFICIENCY FACTOR FOR THE i-TH HOLOGRAPHIC FACET, NORMALIZED RELATIVE TO THE 16TH FACET, ASSIGNED THE SYMBOLIC NOTATION " ξ_i ."
- (17) THE MAXIMUM LIGHT COLLECTION AREA FOR THE i-TH HOLOGRAPHIC FACET, ASSIGNED THE SYMBOLIC NOTATION " $Area_i$."
- (18) THE ANGLE OF SKEW OF THE DIFFRACTED LASER BEAM AT THE CENTER OF THE i-TH HOLOGRAPHIC FACET, ASSIGNED THE SYMBOLIC NOTATION " ϕ_{skew} ."

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PARAMETER EQUATION USED IN THE SPREADSHEET DESIGN OF THE SCANNER

- (1) f_i Focal Length - f_{i-th} facet
- (2) B_i Elevation Angle; $\theta_{dif i} = 90 - B_i$
- (3) θ_{Si}
- (4) $M_i := \frac{r_0}{f_i} \cos(\theta_{skew}) + \cos(\lambda_1) + \cos(B_i)$
- (5) $\theta_{roti} := \frac{\theta_{Si}}{M_i}$
- (6) $\theta'_{roti} := \theta_{roti} + \underbrace{\frac{d_{beam}}{r_0} + \frac{d_{gap}}{r_0}}_{\Theta_{dead}}$
- (7) $\xi_i := \left[\frac{f_i}{f_{20}} \right]^2 \frac{\sin[B_{20}]}{\sin(B_i)} H_i$
- (8) $Area_i := \pi \left[r_{outer}^2 + r_{inner}^2 \right] \frac{\xi_i}{\sum_{i=1}^{20} [\xi_i]} \quad i = 1, 2, \dots, 20$

FIG. 8E

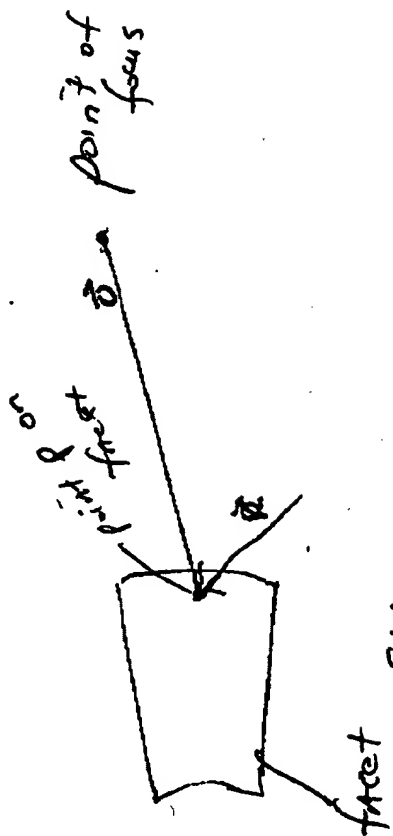


FIG. 8F1

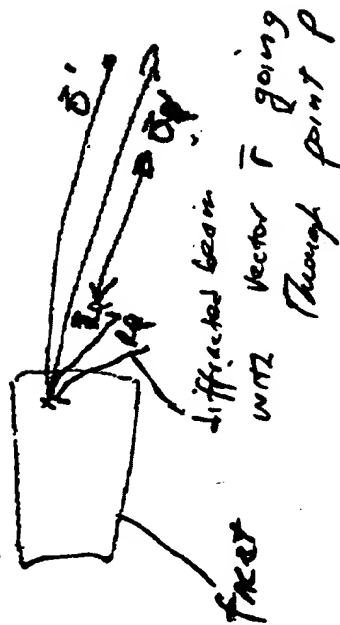


FIG. 8F2

5105 Brown

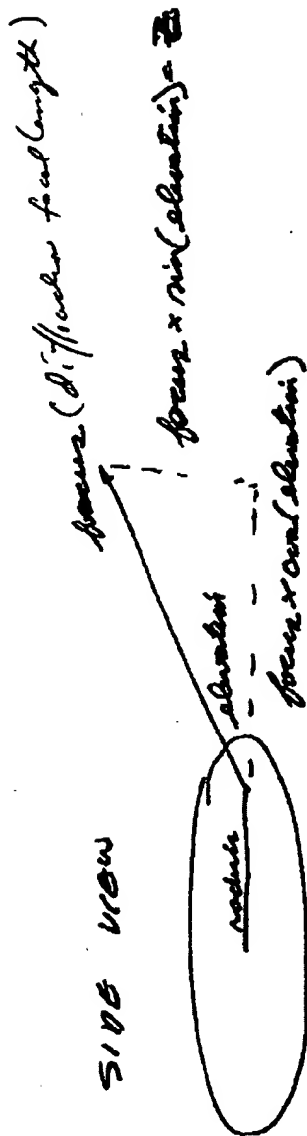
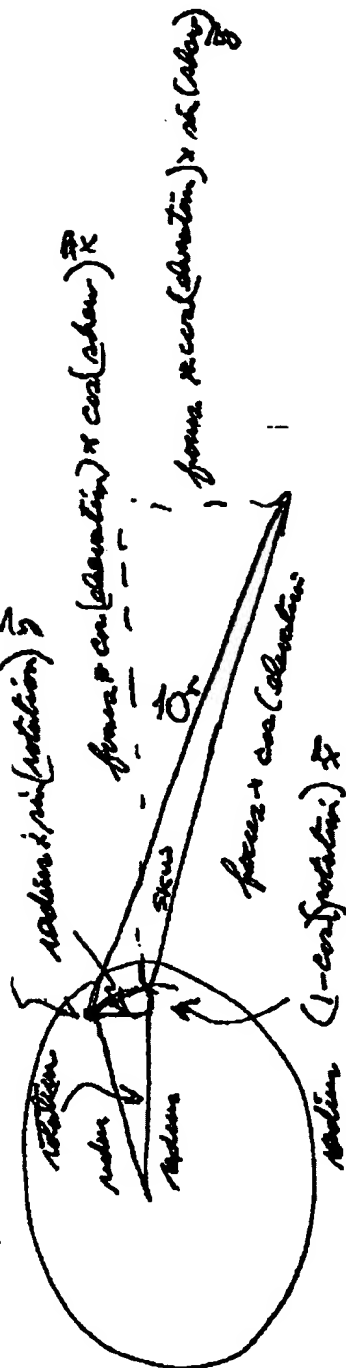


FIG. 8F

Top view



(Or is equal to the sum of these components)

FIG. 8F4

Object ray \vec{O}_p composition:

$$\begin{aligned} \vec{O}_p = & \text{focus} \times \cos(\text{elevation}) \times \cos(\text{skew}) + \text{radius} (1 - \cos(\text{rotation})) \hat{y} \\ & + \text{focus} \times \cos(\text{elevation}) \times \sin(\text{skew}) + \text{radius} \sin(\text{rotation}) \hat{z} \\ & + \text{focus} \times \sin(\text{elevation}) \cdot \hat{x} \end{aligned}$$

where

- focus = The distance
- elevation = elevation angle of face
- skew = skew angle of face
- radius = radius to point P
- rotation = START-MIDDLE-END of scan angles

FIG. 8 F3

[illegible]

FIG. 9

FIG. 9

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GEOMETRICAL OPTICS MODEL FOR HOLOGRAPHIC (TOTAL OUT AND BACK) LIGHT DIFFRACTION EFFICIENCY CALCULATIONS

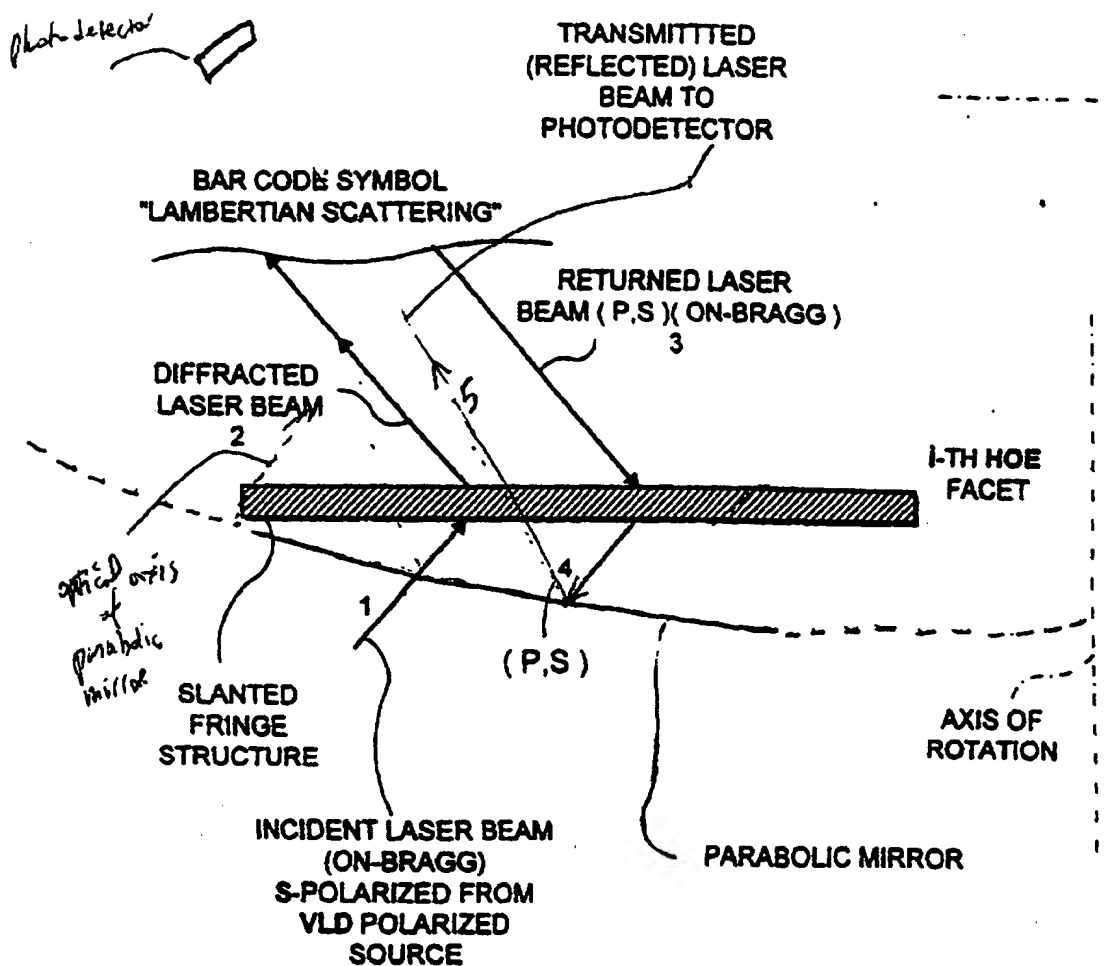


FIG. 10A1

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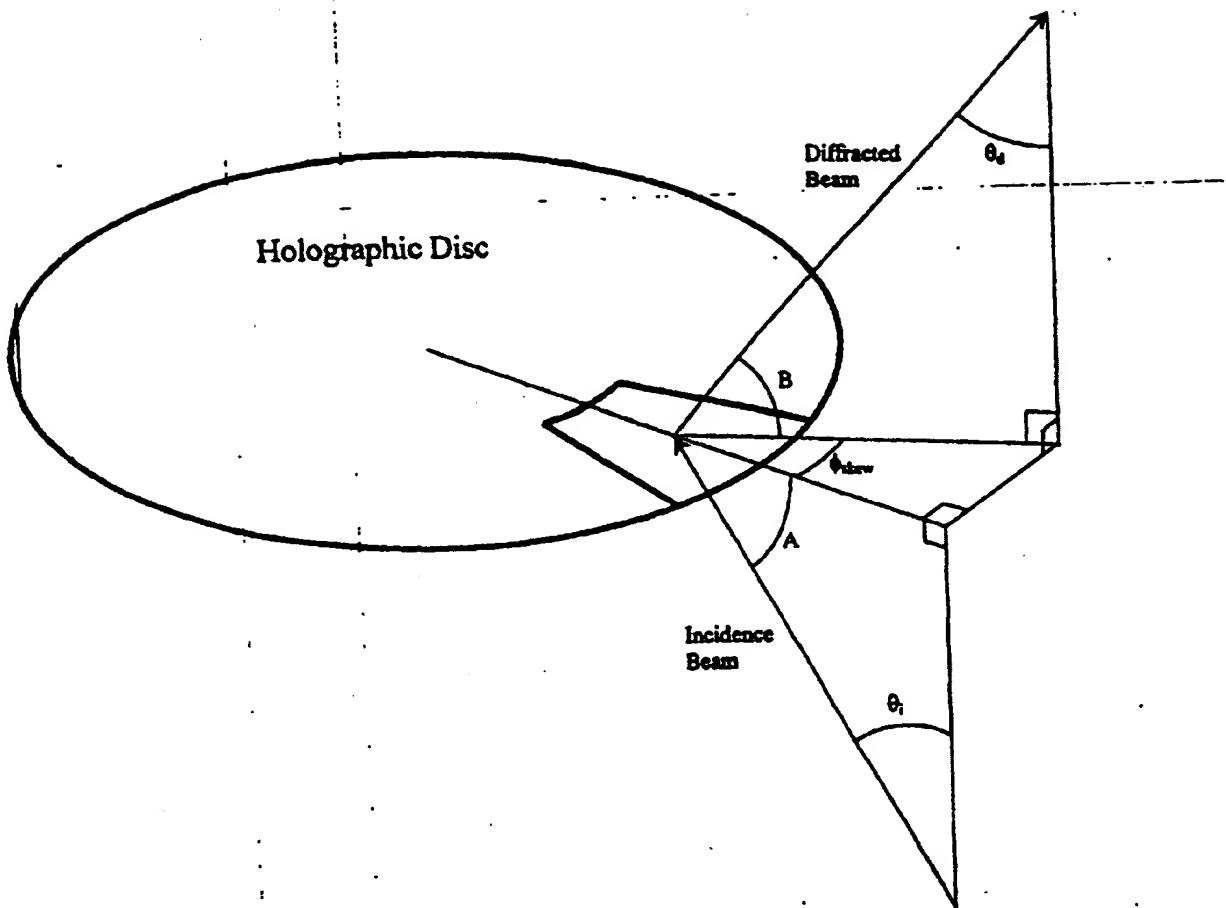


FIG. 10A2

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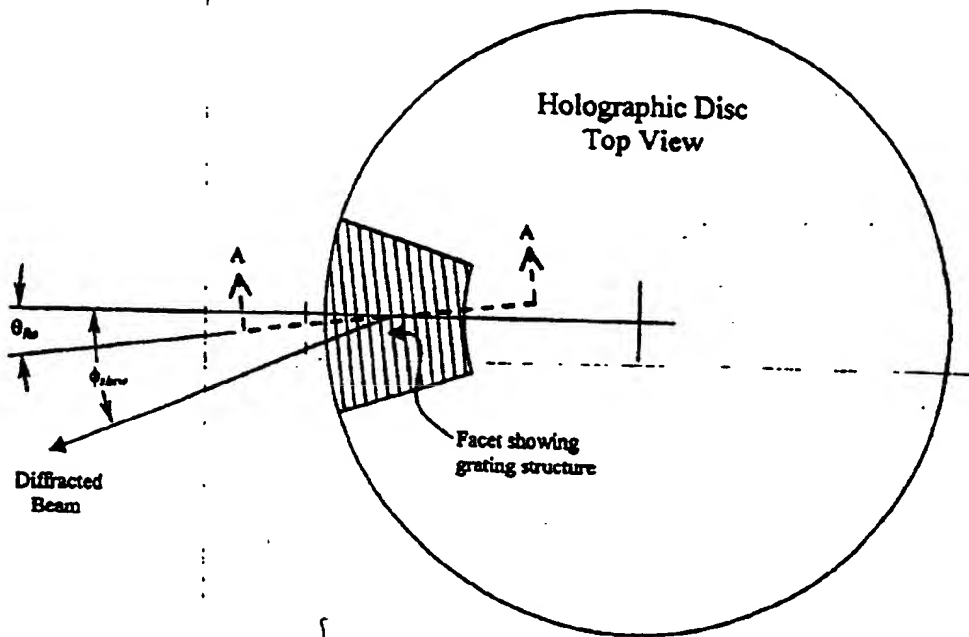


FIG. 10A3

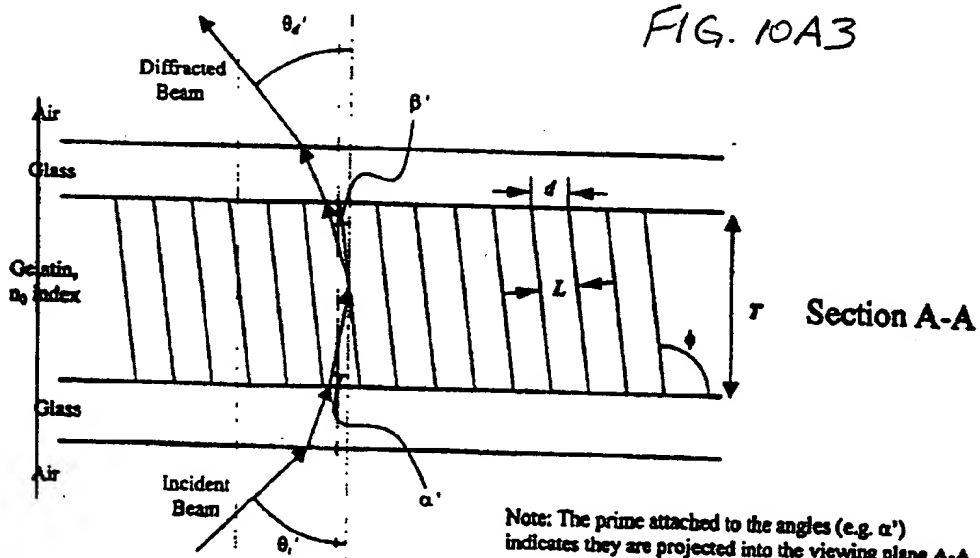


FIG. 10A4

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S AND P DIFFRACTION EFFICIENCY ANALYSIS FOR THE MOST GENERAL CASE

The following analysis takes into consideration slanted fringes, skewed design, off-Bragg effects, and disc rotation effects. It is assumed that the wavelength does not deviate from the design, and that all scattering, absorption, and reflection losses are taken into account by the transmission coefficients, t_s and t_p , which are determined by measurement.

Definitions:

θ_i = Angle of incidence outside the HOE ($\theta_i = 90^\circ - A$);

α = Angle of incidence inside the HOE;

θ_d = Angle of diffraction outside the HOE ($\theta_d = 90^\circ - B$);

β = Angle of diffraction inside the HOE;

ϕ_{skew} = Skew angle of the HOE;

ϕ = Tilt of Bragg planes ($\phi = \pi/2$ for no tilt);

θ_R = Rotation angle of HOE grating ($\theta_R = \theta_{R0}$ when facet is centered);

L = Separation of the Bragg planes;

T = Thickness of the HOE medium;

d = HOE surface fringe spacing;

n_0 = Average refractive index of HOE medium;

n_1 = modulation (i.e. amplitude of periodic variation) of refractive index;

λ_a = Laser wavelength in air;

t_s = Transmission of S-polarization through disc considering losses;

t_p = Transmission of P-polarization through disc considering losses.

FIG. 10B

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$$(1) \quad \alpha = \arcsin\left(\frac{\sin \theta_i}{n_0}\right)$$

$$(2) \quad \beta = \arcsin\left(\frac{\sin \theta_d}{n_0}\right)$$

$$(3) \quad \phi = \arcsin\left(\frac{\cos \beta - \cos \alpha}{\sqrt{2(1 + \sin \alpha \sin \beta \cos \phi_{skew} - \cos \alpha \cos \beta)}}\right) + 90$$

$$(4) \quad d = \sqrt{\frac{\lambda_a^2}{\sin^2 \theta_d \sin^2 \phi_{skew} + (\sin \theta_i + \sin \theta_d \cos \phi_{skew})^2}}$$

$$(5) \quad L = d \sin \phi$$

$$(6) \quad C_R = \cos \alpha$$

$$(7) \quad C_S = \cos \alpha - \frac{\lambda_a}{n_0 L} \cos \phi$$

$$(8) \quad N = \pi n_1 \frac{T}{\lambda_a \sqrt{C_R C_S}}$$

$$\star (9) \quad \theta_{Ro} = \arcsin\left(\frac{d}{\lambda_a} \sin \theta_d \sin \phi_{skew}\right)$$

$$(10) \quad \Gamma = \frac{2\pi(\sin \alpha \sin \phi \cos \theta_{Ro} + \cos \alpha \cos \phi)}{L} - \frac{\pi \lambda_a}{n_0 L^2}$$

$$(11) \quad S = \Gamma \frac{T}{2C_S}$$

Figure 10C1

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$$(12) \quad \kappa = -\sin \alpha \sin \beta \cos \phi_{skew} + \cos \alpha \cos \beta$$

$$(13) \quad E_{par} = \frac{(\sin(\sqrt{N^2 + S^2}))^2}{1 + \frac{S^2}{N^2}}$$

$$(14) \quad E_{perp} = \frac{(\sin(\sqrt{(N\kappa)^2 + S^2}))^2}{1 + \frac{S^2}{(N\kappa)^2}}$$

$$(15) \quad P_{par} = \frac{-\sin \phi \sin \theta_{Ro}}{\sin(\arccos(-\sin \alpha \sin \phi \cos \theta + \cos \alpha \cos \phi))}$$

$$(16) \quad P_{perp} = 1 - P_{par}$$

Diffraction efficiencies E_s and E_p , given losses t_s and t_p , which are specific to each polarization and include absorption, scattering, and reflection losses from AR coatings on the outer surfaces of the disc glass.

$$(17) \quad E_s = (E_{perp} P_{par} + E_{par} P_{perp}) t_s$$

$$(18) \quad E_p = (E_{perp} P_{perp} + E_{par} P_{par}) t_p$$

Total out-and-back efficiency is given by T_s , assuming no polarizer in front of the photodetector

$$(19) \quad T_s = E_s \frac{E_s + E_p}{2}$$

Figure 10C2

$$(20) \theta_d \{\theta_R\} = \arcsin \sqrt{\left(\frac{\lambda_a}{d}\right)^2 - 2 \frac{\lambda_a}{d} \cos \theta_R \sin \theta_i + \sin^2 \theta_i}$$

$$(21) \phi_{skew} \{\theta_R\} = \arctan \left[\frac{\sin \theta_R}{\cos \theta_R - (d/\lambda_a) \sin \theta_i} \right]$$

$$(22) T_s \{\theta_{i \max}\} \cos \theta_d \big|_{\theta_R = \theta_{Ro} - \frac{1}{2} \theta_{ROT}} = T_s \{\theta_{i \max}\} \cos \theta_d \big|_{\theta_R = \theta_{Ro} + \frac{1}{2} \theta_{ROT}}$$

The design efficiency of the i^{th} facet is given by evaluating T_i at the design incidence angle, θ_i , the design rotation angle, θ_{Ro} , and the index modulation that maximizes the efficiency, $n_{i \max}$, given the true maximum efficiency incidence angle, $\theta_{i \max}$, that results from equation (22). The relative efficiency, H_i , is then given by dividing the total efficiency of the first facet by that of the i^{th} facet.

$$(23) H_i = \frac{T_{s1}}{T_{si} \{\theta_i, \theta_{i \max}, \theta_{Ro}, n_{i \max}\}}$$

Figure 10C3

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Diffraction Efficiency Variation with Disc Rotation

Facet 1: before optimization

Fixed design parameters:

$$\theta_i = 38^\circ$$

$$\theta_d = 52^\circ$$

$$\phi_{skew} = 0^\circ$$

$$\lambda_a = 650 \text{ nm}$$

DCG parameters:

$$T = 2.5 \text{ microns}$$

$$n_0 = 1.40$$

$$n_1 = 0.121$$

Relative signal is equal to $T_s \cos \theta_d$. Note that the relative signal falls off as the rotation angle goes away from zero. This is for a maximum efficiency incidence angle, θ_{max} , equal to θ_i (38°). This indicates a non-optimum configuration.

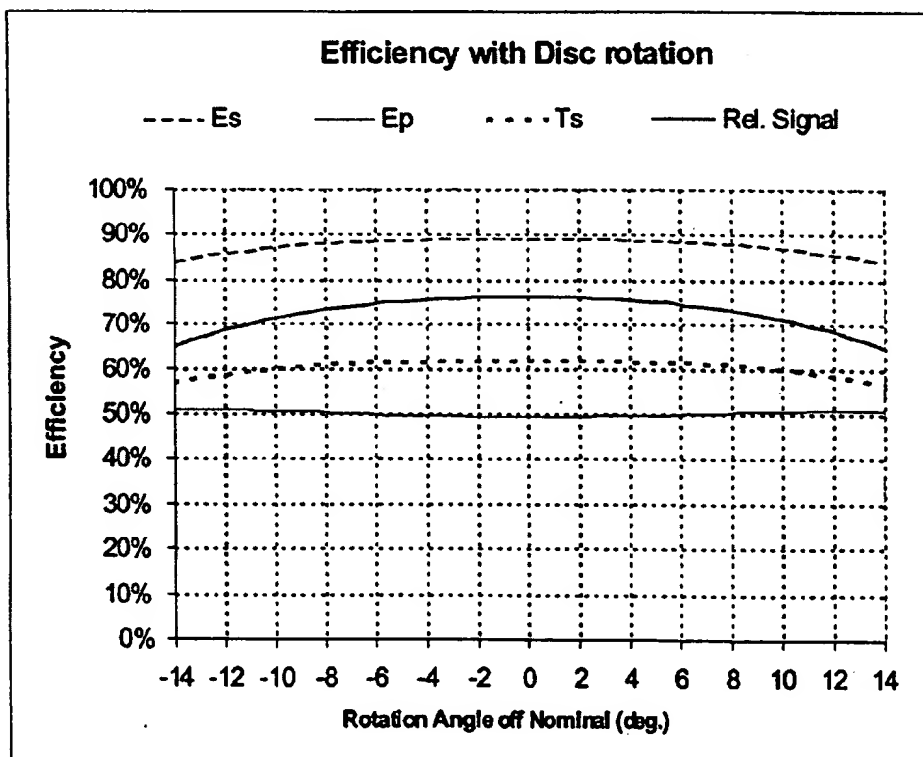


FIG. 10D1

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Diffraction Efficiency Variation with Disc Rotation

Facet 1: after optimization

Fixed design parameters:

$$\theta_i = 38^\circ \quad \theta_d = 52^\circ \quad \phi_{skew} = 0^\circ \quad \lambda_a = 650 \text{ nm}$$

DCG parameters:

$$T = 2.5 \text{ microns} \quad n_0 = 1.40 \quad n_1 = 0.121$$

Relative signal is equal to $T_s \cos \theta_d$. Note that the relative signal at a rotation angle of $\pm 13^\circ$ is equal to the relative signal at 0° . This is achieved when the maximum efficiency incidence angle, θ_{max} , is 36.3° .

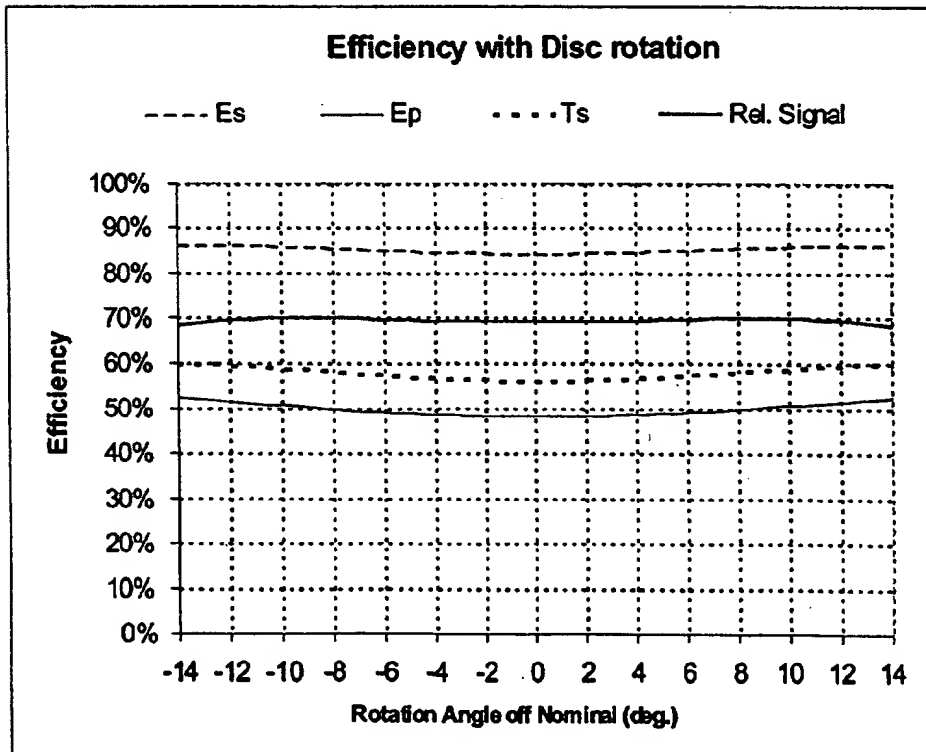


FIG. 10D2

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Diffraction Efficiency Variation with Disc Rotation

Facet 7: before optimization

Fixed design parameters:

$$\theta_i = 38^\circ$$

$$\theta_d = 32^\circ$$

$$\phi_{skew} = 28^\circ$$

$$\lambda_d = 650 \text{ nm}$$

DCG parameters:

$$T = 2.5 \text{ microns}$$

$$n_0 = 1.40$$

$$n_1 = 0.121$$

Relative signal is equal to $T_s \cos \theta_d$. Note that the relative signal falls off as the rotation angle goes from negative to positive. This is for a maximum efficiency incidence angle, θ_{imax} , equal to θ_i (38°). This indicates a non-optimum configuration.

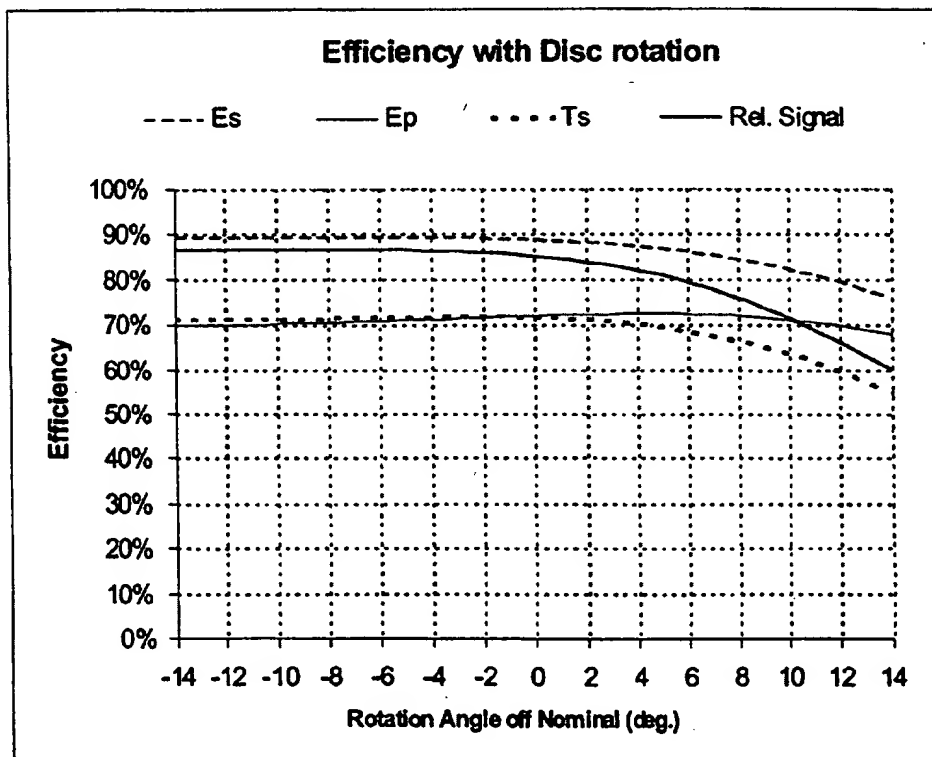


FIG. 10E1

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Diffraction Efficiency Variation with Disc Rotation

Facet 7; after optimization

Fixed design parameters:

$$\theta_i = 38^\circ$$

$$\theta_d = 32^\circ$$

$$\phi_{skew} = 28^\circ$$

$$\lambda_d = 650 \text{ nm}$$

DCG parameters:

$$T = 2.5 \text{ microns}$$

$$n_0 = 1.40$$

$$n_1 = 0.121$$

Relative signal is equal to $T_s \cos \theta_d$. Note that the relative signal at a rotation angle of -14° is equal to the relative signal at $+14^\circ$. This is achieved when the maximum efficiency incidence angle, θ_{max} , is 35.8° .

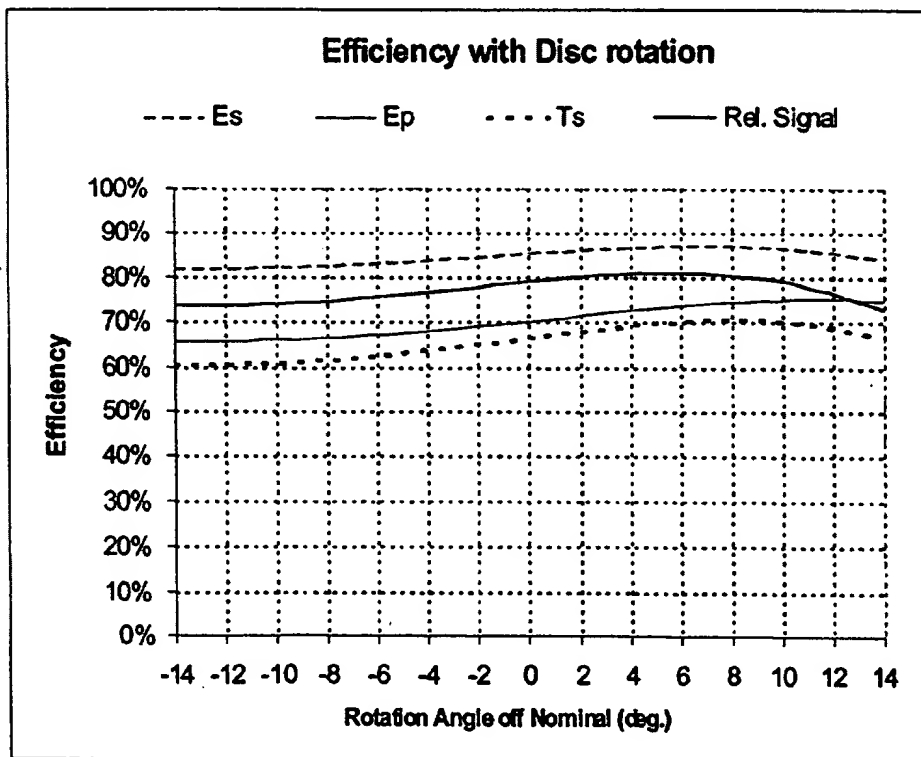


FIG. 10E2

S and P Diffraction Efficiency Calculations

It is assumed that there is no deviation from the nominal wavelength.

Facet-independent design parameters:

Design wavelength: 650 nm
 External incidence angle: 38 deg
 Internal incidence angle: 26.09 deg
 Gelatin effective thickness: 2.5 microns
 Average bulk refractive index: 1.4
 Refractive index modulation: 0.121
 S-polarization losses: 10%
 P-polarization losses: 10%
 degrees to radians conversion: 0.017453

Facet	θ_d (deg.)	β (deg.)	ϕ_{skew} (deg.)	d (nm)	θ_{Ro} (deg.)	θ_{Imax} (deg.)	α_{max} (deg.)	β_{max} (deg.)	ϕ_{smax} (deg.)	ϕ (deg.)	L (nm)	θ_{ROT} (deg.)
1	52.00	34.25	0	463.1	0.00	36.30	25.02	35.43	0.00	84.79	461.2	26.24
2	50.00	33.17	0	470.4	0.00	36.30	25.02	34.34	0.00	85.34	468.9	28.35
3	48.00	32.06	0	478.4	0.00	36.30	25.02	33.21	0.00	85.90	477.1	26.66
4	46.00	30.92	0	486.9	0.00	36.30	25.02	32.05	0.00	86.48	486.0	29.19
5	42.00	28.55	0	505.9	0.00	36.30	25.02	29.66	0.00	87.68	505.5	27.97
6	38.00	26.09	0	527.9	0.00	36.30	25.02	27.17	0.00	88.92	527.8	30.28
7	32.00	22.24	28	584.7	12.93	35.80	24.70	23.45	26.52	90.64	584.6	27.99
8	32.00	22.24	-28	584.7	-12.93	35.80	24.70	23.45	-26.52	90.64	584.6	27.99
9	30.00	20.92	28	600.2	12.52	35.56	24.55	22.26	26.27	91.17	600.1	30.65
10	30.00	20.92	-28	600.2	-12.52	35.56	24.55	22.26	-26.27	91.17	600.1	30.65
11	28.00	19.59	28	617.0	12.08	35.72	24.65	20.83	26.28	91.98	616.6	29.19
12	28.00	19.59	-28	617.0	-12.08	35.72	24.65	20.83	-26.28	91.98	616.6	29.19

FIG. 10F1

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C_R
0.888

C_S	N	θ_d		β		ϕ_{skew}		Γ		S	
		$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$	$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$	$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$	$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$	$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$
0.807	1.718	54.70	54.70	35.66	35.66	-22.98	22.98	0.0634	0.2192	0.0982	0.3397
0.818	1.708	53.05	53.05	34.81	34.81	-25.05	25.05	0.0380	0.2168	0.0581	0.3315
0.829	1.695	50.61	50.61	33.51	33.51	-23.91	23.91	0.0588	0.2143	0.0885	0.3232
0.839	1.684	49.05	49.05	32.65	32.65	-26.45	26.45	0.0285	0.2116	0.0424	0.3150
0.861	1.663	44.69	44.69	30.16	30.16	-26.20	26.20	0.0438	0.2057	0.0636	0.2987
0.882	1.643	41.07	41.07	27.99	27.99	-29.30	29.30	0.0176	0.1992	0.0250	0.2825
0.907	1.620	29.76	38.91	20.76	26.66	-2.39	53.28	0.3498	0.2307	0.4820	0.3180
0.907	1.620	38.91	29.76	26.66	20.76	-53.28	2.39	-0.1618	0.2307	-0.2230	0.3180
0.914	1.614	27.98	37.62	19.57	25.85	-6.49	55.95	0.3549	0.2510	0.4854	0.3432
0.914	1.614	37.62	27.98	25.85	19.57	-55.95	6.49	-0.1726	0.2510	-0.2360	0.3432
0.924	1.605	26.06	35.04	18.29	24.21	-6.05	55.44	0.3252	0.2304	0.4400	0.3118
0.924	1.605	35.04	26.06	24.21	18.29	-55.44	6.05	-0.1470	0.2304	-0.1888	0.3118

FIG. 10F2

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$-\frac{1}{2}\theta_{ROT}$	K θ_{RO}	E_{par} θ_{RO}		E_{perp} θ_{RO}		P_{par} θ_{RO}		P_{perp} θ_{RO}	
		$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$	$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$	$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$	$-\frac{1}{2}\theta_{ROT}$	$+\frac{1}{2}\theta_{ROT}$
0.5028	0.4948	0.9746	0.9315	0.5759	0.5419	0.0580	0.0000	0.9420	1.0000
0.5187	0.5111	0.9804	0.9389	0.5983	0.5639	0.0680	0.0000	0.9320	1.0000
0.5354	0.5277	0.9814	0.9420	0.6192	0.5860	0.0609	0.0000	0.9391	1.0000
0.5518	0.5445	0.9865	0.9468	0.6416	0.6082	0.0733	0.0000	0.9287	1.0000
0.5660	0.5787	0.9899	0.9552	0.6834	0.6621	0.0688	0.0000	0.9312	1.0000
0.6200	0.6132	0.9945	0.9623	0.7248	0.6947	0.0818	0.0000	0.9182	1.0000
0.6918	0.6843	0.9056	0.9567	0.7442	0.7720	0.0004	0.0620	0.9996	0.9380
0.6906	0.6843	0.9773	0.9567	0.7946	0.7720	0.2446	0.0620	0.7554	0.9380
0.7080	0.7002	0.9051	0.9508	0.7584	0.7833	0.0030	0.0587	0.9970	0.9413
0.7068	0.7002	0.9755	0.9508	0.8093	0.7833	0.2614	0.0587	0.7386	0.9413
0.7227	0.7159	0.9220	0.9597	0.7823	0.8032	0.0025	0.0555	0.9975	0.9445
0.7221	0.7159	0.9828	0.9597	0.8276	0.8032	0.2452	0.0555	0.7548	0.9445

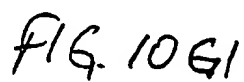
FIG. 10F3

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E_s		E_p		T_s		H_i	Solver (=0)
$-\frac{1}{2}\theta_{ROT}$	θ_{Ro}	$-\frac{1}{2}\theta_{ROT}$	θ_{Ro}	$-\frac{1}{2}\theta_{ROT}$	θ_{Ro}		
85.6%	83.8%	85.6%	48.8%	59.7%	55.6%	1.000	0
85.9%	84.3%	85.9%	50.8%	61.0%	57.0%	0.976	0
86.3%	84.8%	86.3%	52.7%	62.2%	58.3%	0.953	0
86.5%	85.2%	86.5%	54.7%	63.4%	59.6%	0.932	0
87.2%	86.0%	87.2%	58.7%	65.7%	62.2%	0.894	0
87.5%	86.6%	87.5%	62.5%	67.7%	64.6%	0.861	0
81.5%	85.1%	83.9%	70.5%	60.5%	66.2%	0.840	0.020396813
83.9%	85.1%	81.5%	70.5%	66.9%	66.2%	0.840	0.020396813
81.4%	84.7%	83.9%	71.4%	60.9%	66.1%	0.841	0.02187036
83.9%	84.7%	81.4%	71.4%	67.4%	66.1%	0.841	0.02187036
82.9%	85.6%	85.0%	73.1%	63.6%	67.9%	0.819	0.019325482
85.0%	85.6%	82.9%	73.1%	69.3%	67.9%	0.819	0.019325482
							0.255193744

Figure 10F4

Time	Location	Activity	Notes
08:00	Field Station	Arrival	Weather: Clear, 25°C
08:30	Field Station	Equipment Check	Batteries full, GPS working
09:00	Field Station	Breakfast	Consumed 1.5L water
09:30	Field Station	Departure	Heading North
10:00	Field Station	Arrival	Reached destination
10:30	Field Station	Setup	Established camp
11:00	Field Station	Observation	Noted bird activity
11:30	Field Station	Breakfast	Consumed 1.5L water
12:00	Field Station	Departure	Heading South
12:30	Field Station	Arrival	Reached destination
13:00	Field Station	Setup	Established camp
13:30	Field Station	Observation	Noted bird activity
14:00	Field Station	Breakfast	Consumed 1.5L water
14:30	Field Station	Departure	Heading West
15:00	Field Station	Arrival	Reached destination
15:30	Field Station	Setup	Established camp
16:00	Field Station	Observation	Noted bird activity
16:30	Field Station	Breakfast	Consumed 1.5L water
17:00	Field Station	Departure	Heading East
17:30	Field Station	Arrival	Reached destination
18:00	Field Station	Setup	Established camp
18:30	Field Station	Observation	Noted bird activity
19:00	Field Station	Breakfast	Consumed 1.5L water
19:30	Field Station	Departure	Heading North
20:00	Field Station	Arrival	Reached destination
20:30	Field Station	Setup	Established camp
21:00	Field Station	Observation	Noted bird activity
21:30	Field Station	Breakfast	Consumed 1.5L water
22:00	Field Station	Departure	Heading South
22:30	Field Station	Arrival	Reached destination
23:00	Field Station	Setup	Established camp
23:30	Field Station	Observation	Noted bird activity
00:00	Field Station	Breakfast	Consumed 1.5L water



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FACET LIGHT COLLECTION EFFICIENCY

Z = DISTANCE FROM SCAN POINT ON LABEL (MAX = FOCAL)
LENGTH PLUS 5 INCHES

Area = AREA OF CORRESPONDING FACET

R = RADIUS OF EFFECTIVE CIRCULAR APERTURE

R.pr = RADIUS OF PROJECTED EFFECTIVE CIRCULAR APERTURE

B = ANGLE BETWEEN OUTGOING BEAM AND THE DISC

δ = HALF-ANGLE SUBTENDED BY EFFECTIVE PROJECTED
CIRCULAR APERTURE

E.L = LAMBERTIAN LIGHT COLLECTION EFFICIENCY

FIG. 10G2

$$R_{pr} : = \sqrt{\frac{\text{Area} \sin B}{\pi}}$$

$$\delta : = \text{atan} \left[\frac{R_{pr}}{Z} \right]$$

$$E_L : = (\sin(\delta))^2$$

FIG. 10G3

[illegible]

FIG. 11A1

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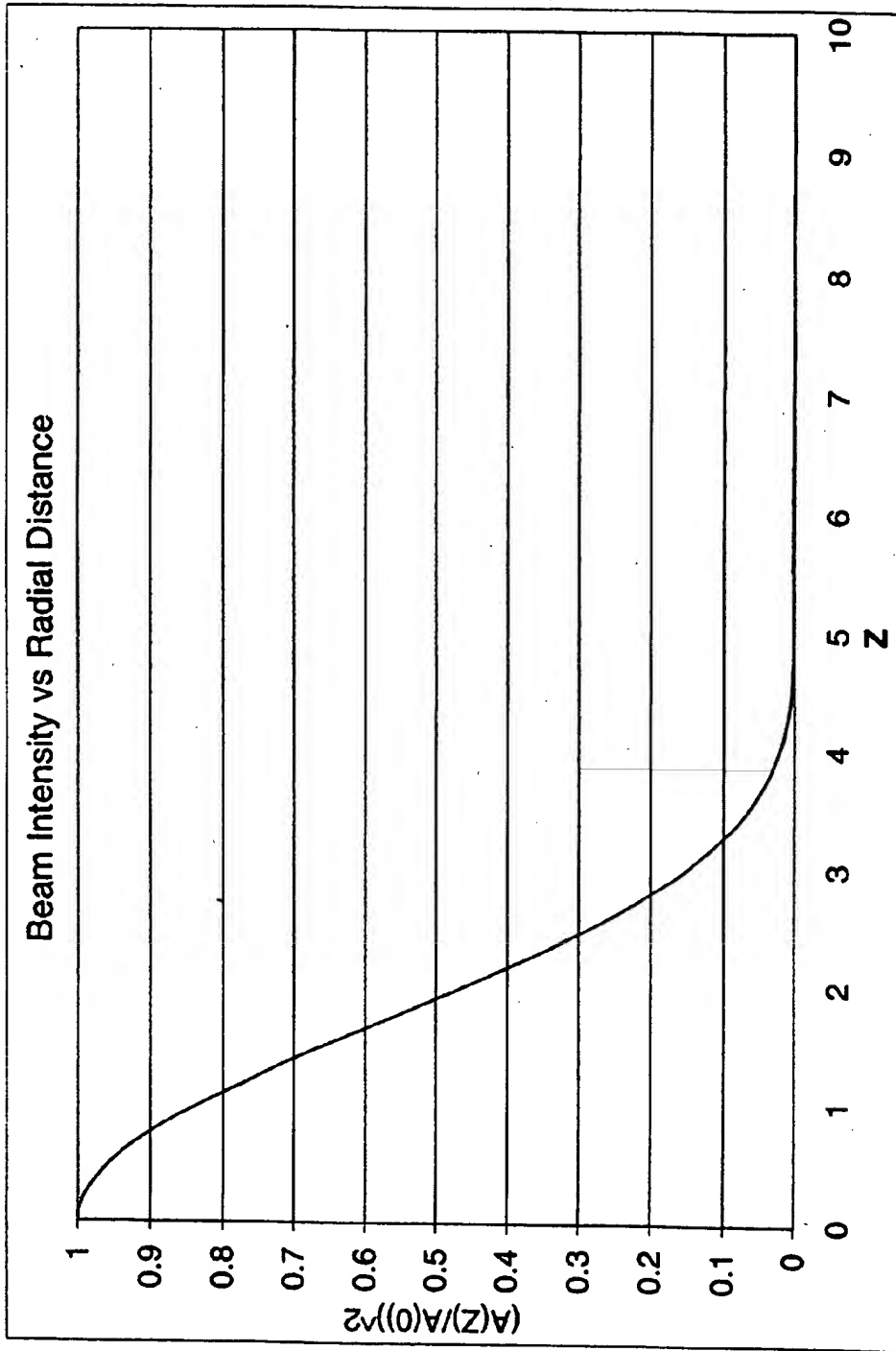


FIG. 11A2

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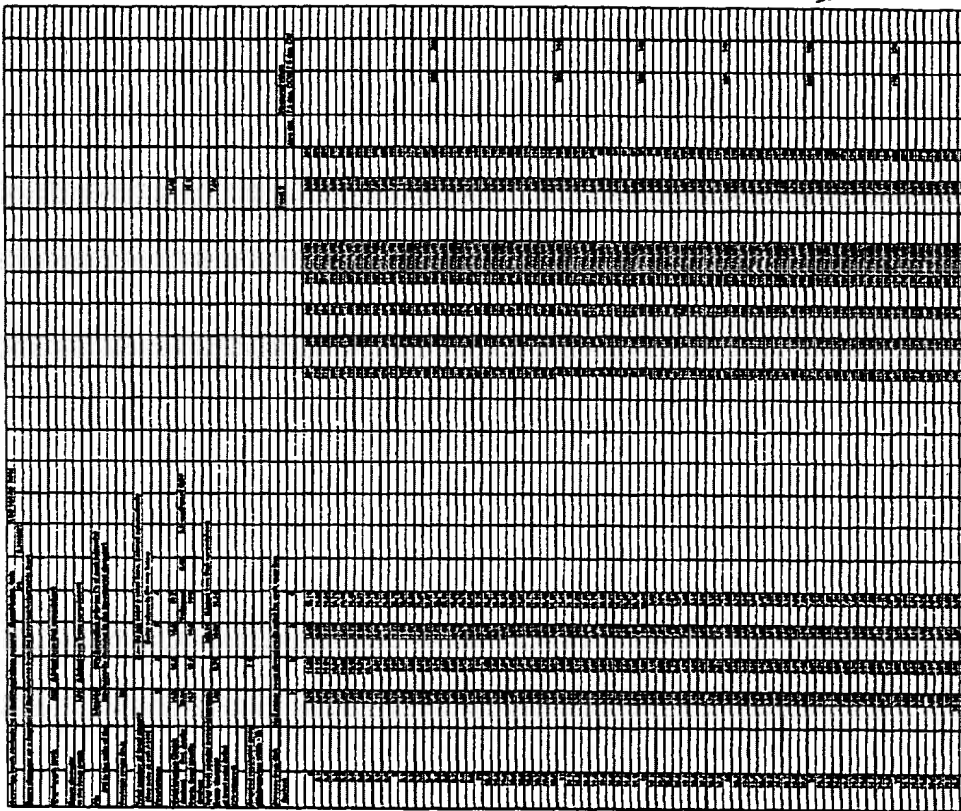


FIG 11B1

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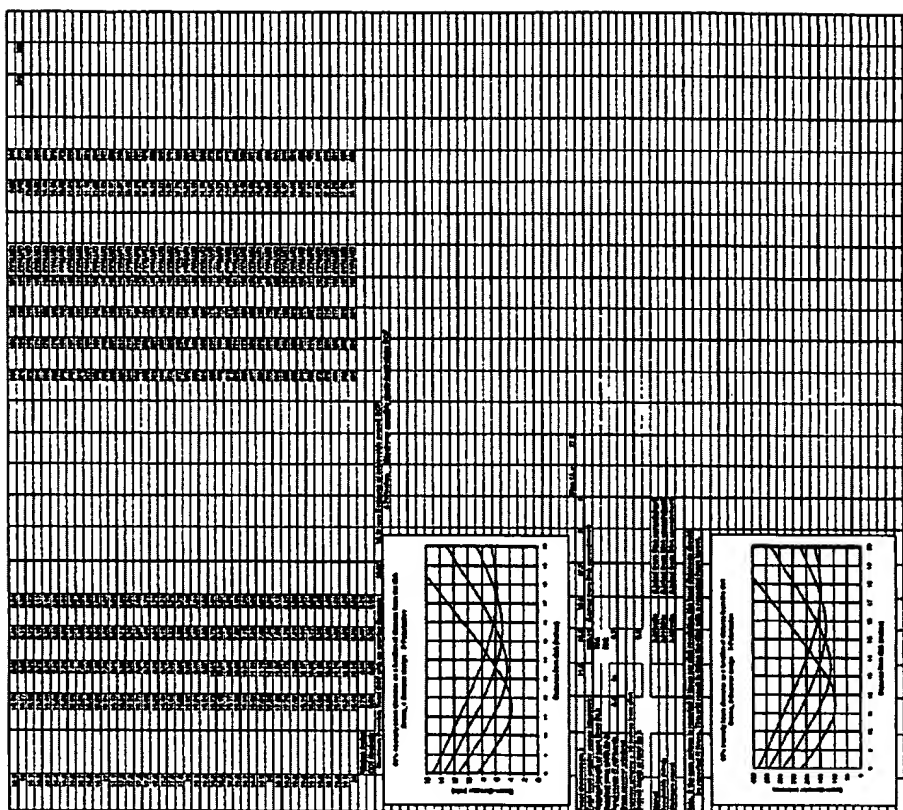


FIG. 11B2

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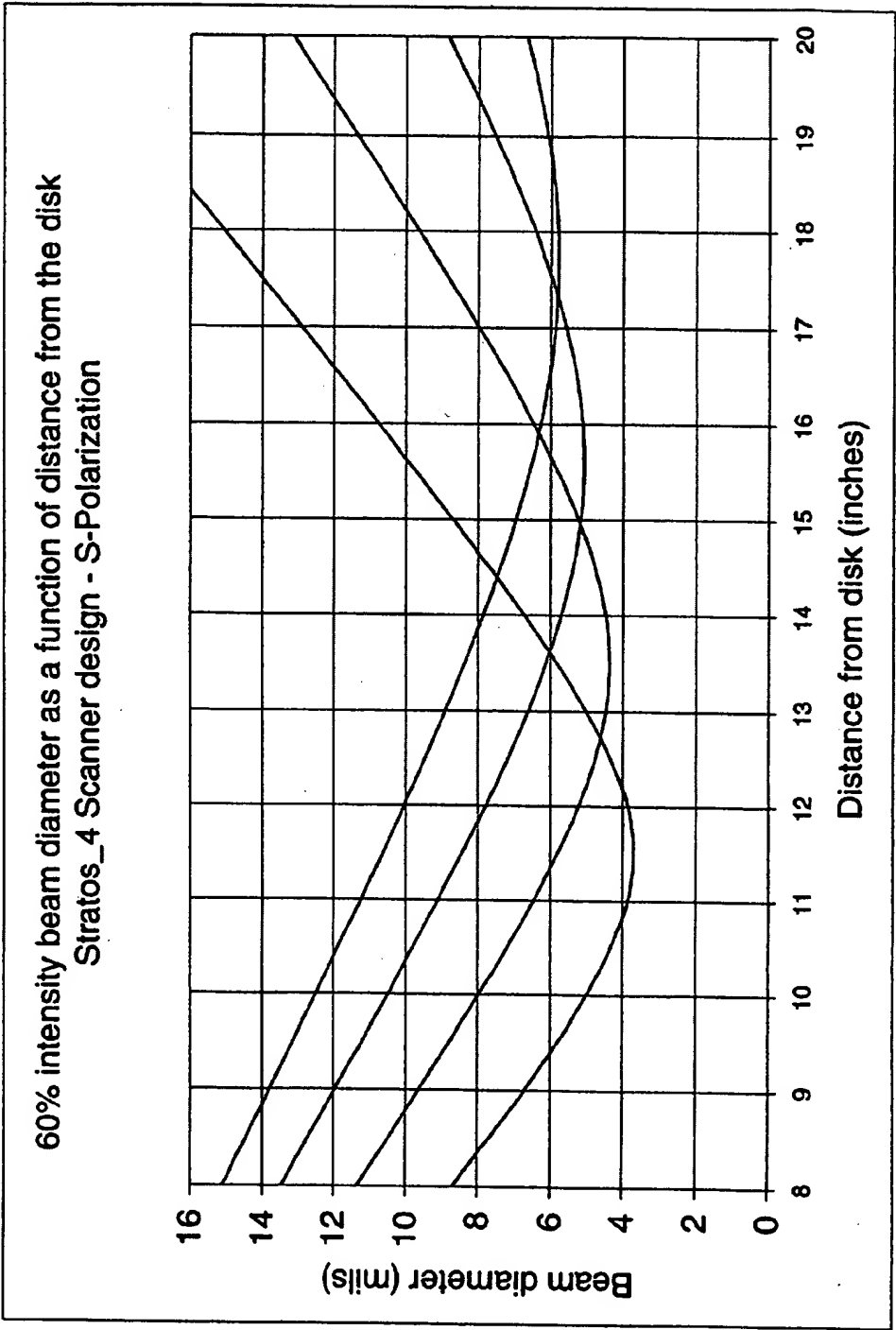


FIG. 11B3

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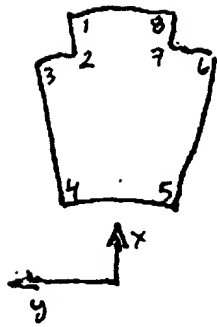


FIG. 12A1

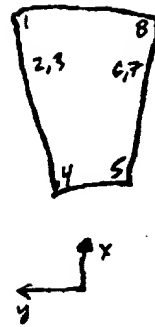


FIG. 12A2

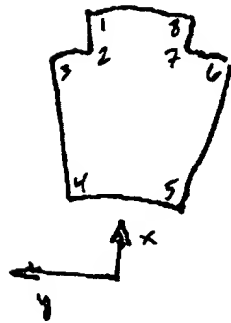


FIG. 12B1

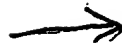


FIG. 12B2

294/335

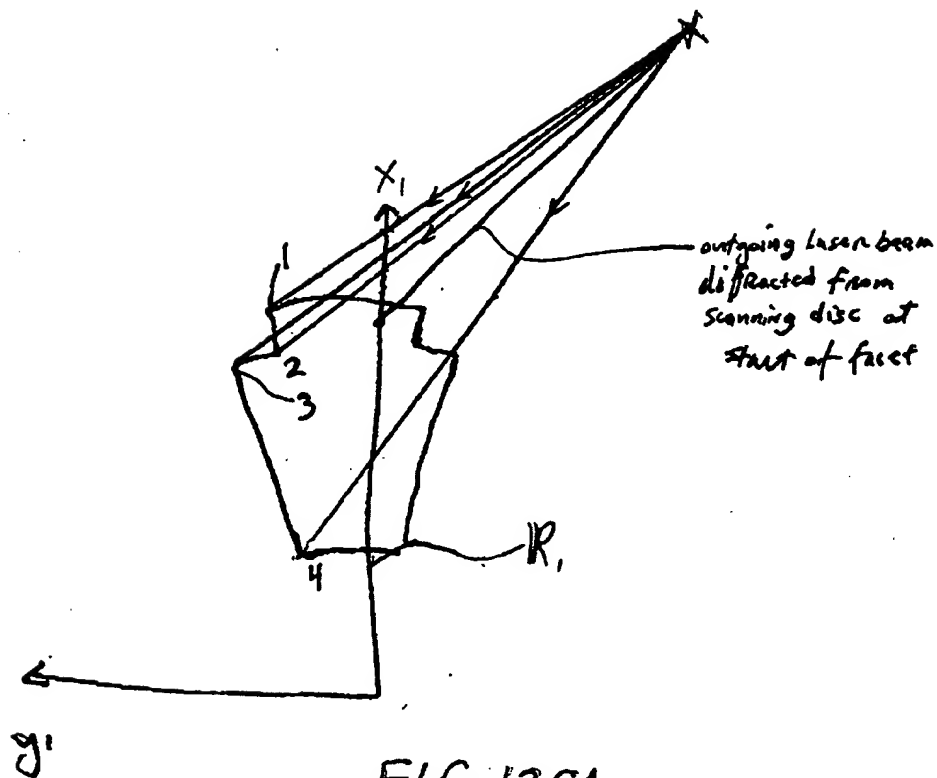


FIG. 12C1

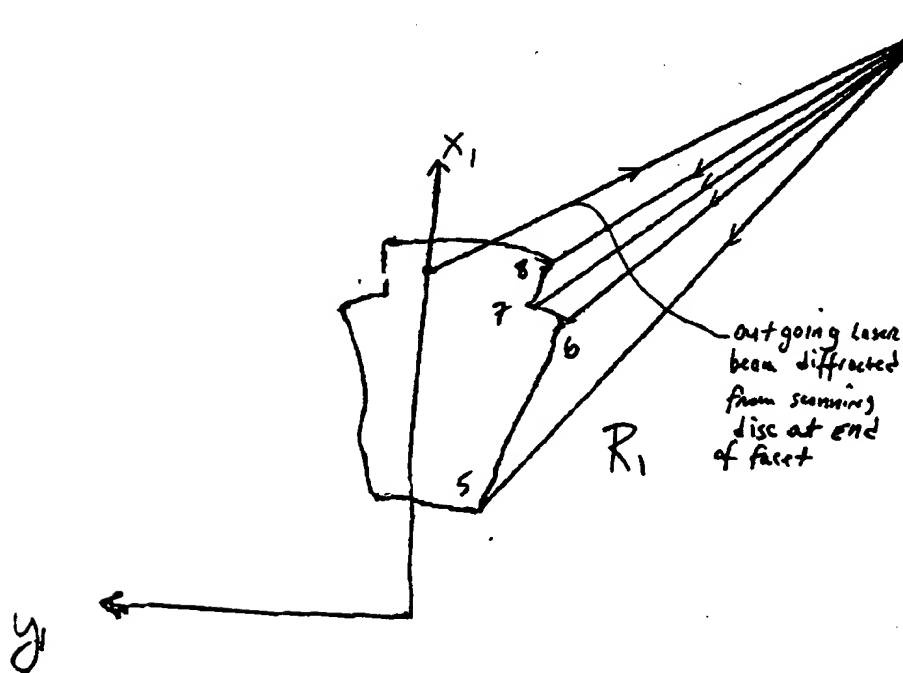


FIG. 12C2

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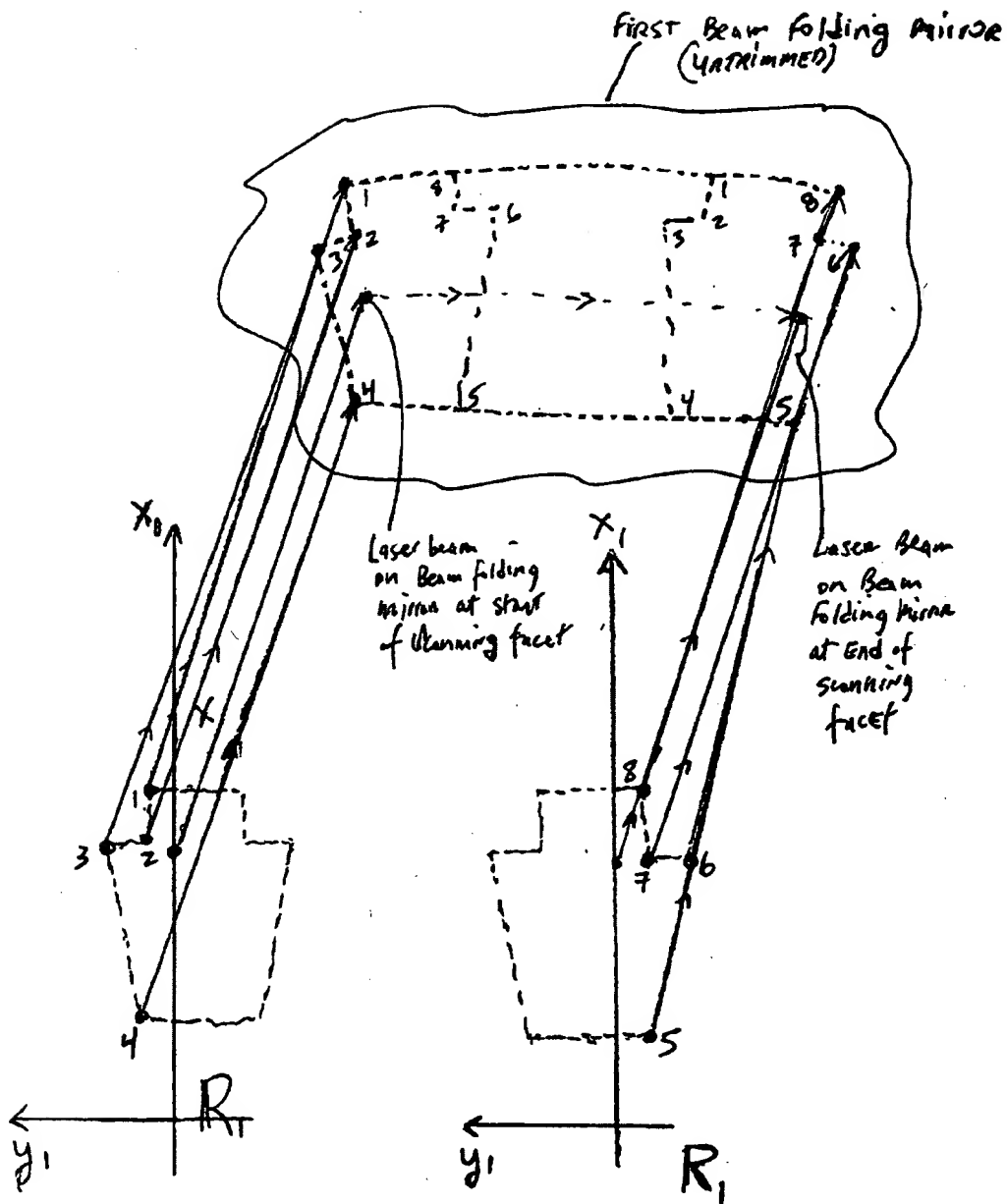


FIG 12D

2.96/335

	A	B	C	D	E	F	G	H	I	J
75		1			2			3		
76		Facet			Facet			Facet		
77	G1	8			10			12		
78	Point 1	3.94874	-0.02294	2.12380	3.83250	0.07718	2.09937	3.75358	0.10925	2.09325
79	Point 2	3.65113	-0.12038	2.16443	3.53978	-0.02865	2.14166	3.45010	0.00887	2.13498
80	Point 3	3.61581	-0.03502	2.14098	3.53978	-0.02665	2.14166	3.44555	0.02059	2.13175
81	Point 4	2.64691	-0.40575	2.28887	2.88384	-0.25930	2.23843	2.44051	-0.31915	2.27208
82	Point 5	2.79472	-1.59304	2.62907	3.02644	-1.72489	2.65801	2.54068	-1.56107	2.63017
83	Point 6	3.81419	-2.04371	2.71867	3.69455	-2.02108	2.71697	3.56179	-2.02254	2.72286
84	Point 7	3.82807	-1.96478	2.69504	3.69455	-2.02106	2.71697	3.56439	-2.01174	2.71960
85	Point 8	4.13065	-2.08452	2.71758	3.98563	-2.15005	2.74265	3.86380	-2.14515	2.74822
86	Point 9	3.94874	-0.02294	2.12380	3.83250	0.07718	2.09937	3.75358	0.10925	2.09325
87	Start of scan line	4.02545	-0.67817	2.31174	3.92247	-0.62341	2.30000	3.82454	-0.57134	2.28883
88	Middle of rotation	4.02545	-0.67817	2.31174	3.92247	-0.62341	2.30000	3.82454	-0.57134	2.28883
89	End of scan line	4.04162	-1.16307	2.45250	3.82934	-1.15980	2.45580	3.81937	-1.12321	2.44999
90										

FIG 13A1

MR1

Station 1

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	A	B	C	D	E	F	G	H	I	J
91		Facet			Facet			Facet		
92	G2	7			9			11		
93	Point 1	4.02247	2.19033	2.58609	3.91799	2.45353	2.76685	3.80802	2.74420	2.96322
94	Point 2	3.79236	2.11753	2.69195	3.69690	2.38537	2.86040	3.58337	2.84904	3.05579
95	Point 3	3.78639	2.20453	2.73451	3.69690	2.38537	2.86040	3.58162	2.66095	3.06217
96	Point 4	3.05197	1.92230	3.05003	3.21262	2.17226	3.06533	2.85731	2.94705	3.35743
97	Point 5	2.64347	-0.27369	2.31221	2.81913	-0.34045	2.17660	2.54140	-0.10460	2.44937
98	Point 6	3.25774	-0.84215	1.68794	3.25935	-0.70440	1.74867	3.23044	-0.61968	1.80401
99	Point 7	3.29898	-0.76438	1.69797	3.25935	-0.70440	1.74867	3.23562	-0.60869	1.80582
100	Point 8	3.60262	-0.93172	1.50046	3.46547	-0.87482	1.54830	3.45674	-0.77127	1.59994
101	Point 9	4.02247	2.19033	2.58609	3.91799	2.45353	2.76685	3.80802	2.74420	2.96322
102	Start of scan line	3.88910	1.13139	2.19201	3.81752	1.25640	2.29108	3.73628	1.40993	2.40874
103	Middle of rotation	3.83943	0.57926	1.97459	3.76954	0.64210	2.00000	3.70069	0.50549	2.02503
104	End of scan line	3.77386	0.09914	1.79899	3.72144	0.14315	1.85024	3.66728	0.18290	1.90064
105										

FIG. 13A2

MR1

Station 1

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	A	B	C	D	E	F	G	H	I	J	K	L	M
106		Facet 1			Facet 2			Facet 3			Facet 4		
107 GS													
108	Point 1	5.11817	1.95390	1.89155	5.01400	1.88083	1.98716	4.92433	1.81870	2.03385	4.82798	1.76935	2.10578
109	Point 2	4.98460	1.86804	1.88969	4.88138	1.79109	2.06571	4.77984	1.72880	2.14196	4.88407	1.68502	2.21258
110	Point 3	4.94695	2.08109	2.03847	4.88064	1.79549	2.06887	4.75882	1.88942	2.17507	4.88407	1.68502	2.21258
111	Point 4	4.55990	1.89707	2.31642	4.46955	1.51422	2.37191	4.31720	1.51260	2.49402	4.34215	1.44090	2.48771
112	Point 5	4.95785	-1.83559	2.18575	4.28296	-1.52325	2.24765	4.14496	-1.55897	2.38336	4.17985	-1.53987	2.33686
113	Point 6	4.71038	-2.01784	1.88940	4.68022	-1.80322	1.91239	4.54753	-1.91413	2.00815	4.50148	-1.76328	2.05953
114	Point 7	4.77395	-1.80820	1.83893	4.68147	-1.78883	1.91177	4.59009	-1.77513	1.98718	4.50148	-1.76328	2.05953
115	Point 8	4.89971	-1.89063	1.72862	4.80732	-1.88882	1.80291	4.72764	-1.86391	1.86903	4.83750	-1.86821	1.94186
116	Point 9	5.11617	1.95390	1.89155	5.01400	1.88083	1.98716	4.92433	1.81870	2.03385	4.82798	1.76935	2.10578
117	Start of scan line	6.11614	1.00830	1.80878	5.02116	0.94389	1.87835	4.92928	0.88655	1.84798	4.84129	0.83137	2.01383
118	Middle of rotation	5.03523	0.00000	1.78542	4.95474	0.00000	1.85000	4.87537	0.00000	1.91389	4.79689	0.00000	1.97668
119	End of scan line	5.00607	-0.96140	1.72464	4.82129	-0.94701	1.78383	4.83778	-0.91710	1.86358	4.75656	-0.89981	1.83026
120													

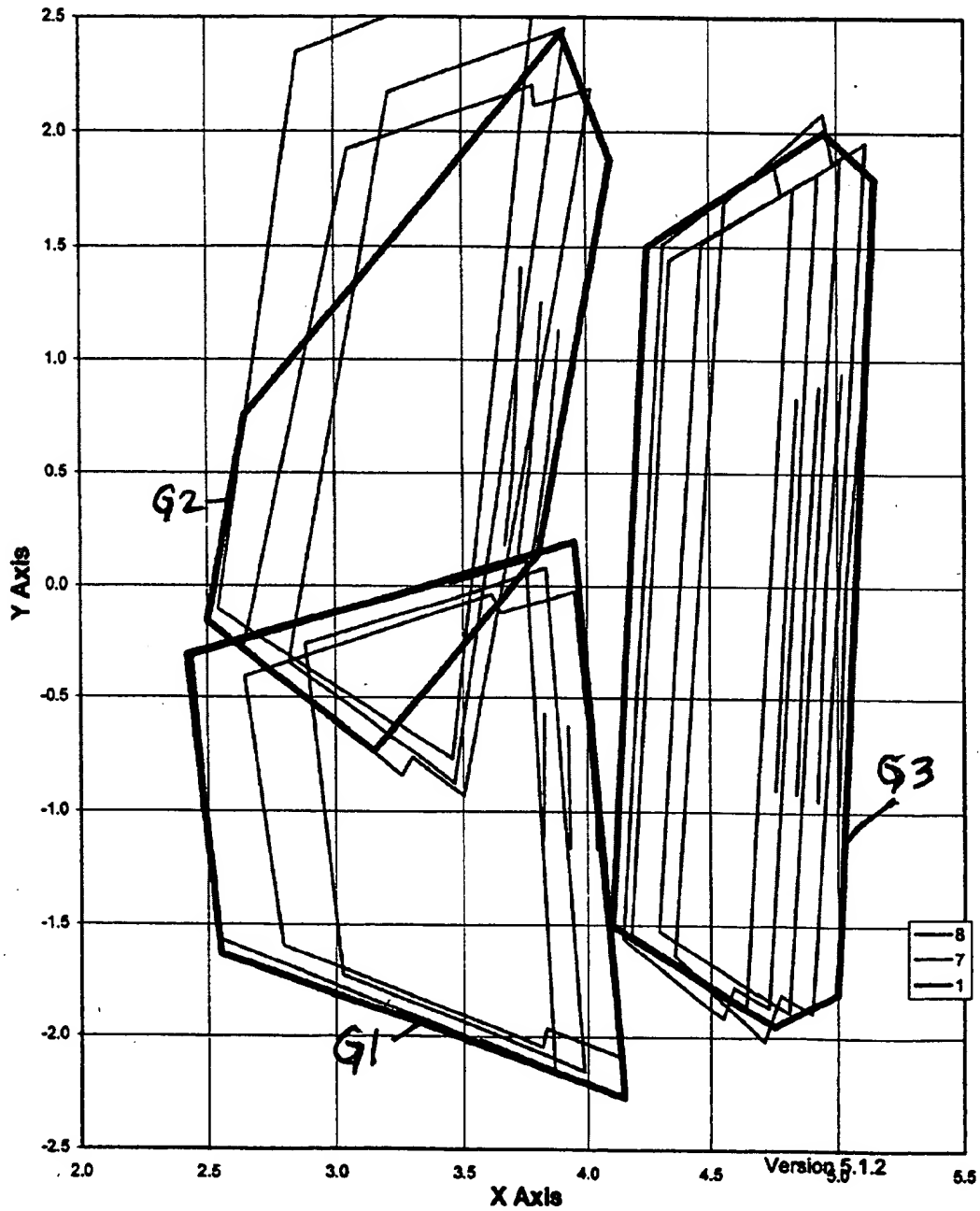
FIG. 13A3

MR1

Station 1

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Station 1 M1- XY Plane

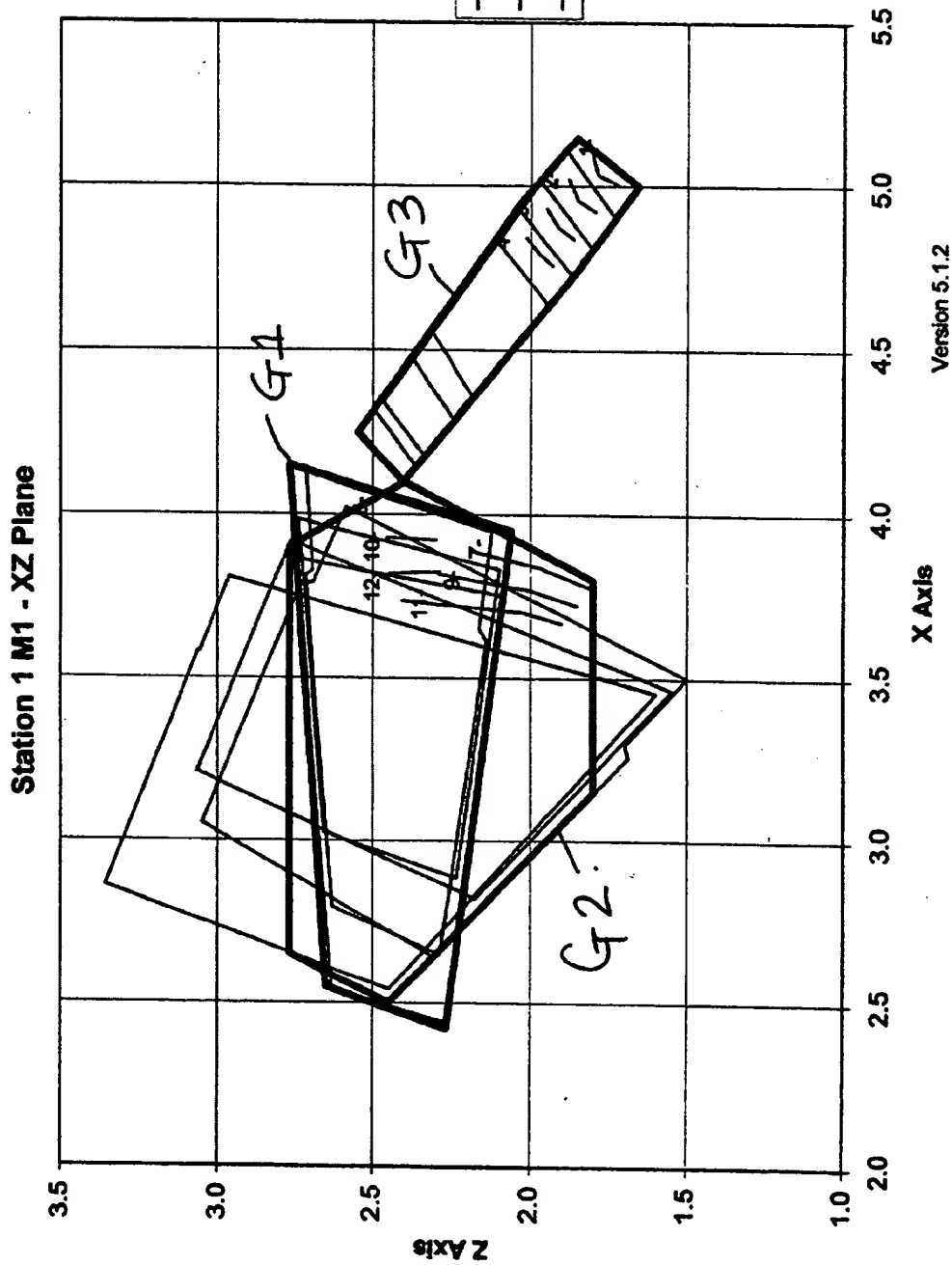


Station 1

MR1.xy

FIG. 13A4

8	7	1
—	—	—



Version 5.1.2

MR1.xz

Station 1

FIG. 13A5

MR1.yz4/3/00

Station 1 M1 - YZ Plane

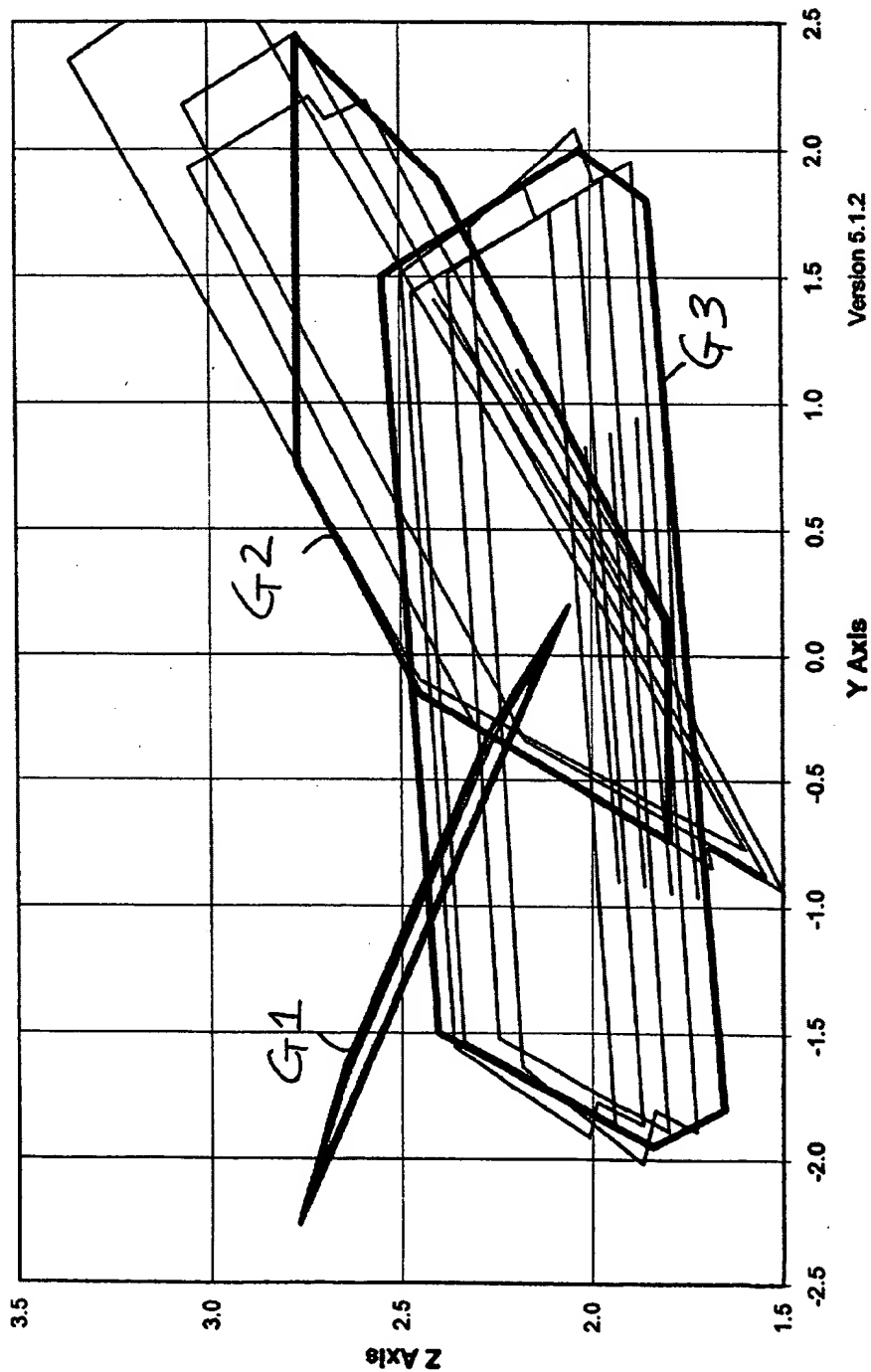


FIG. 13A6

MR1.yz4/3/00

Station 1

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	A	B	C	D	E	F	G	H	I	J
75		1			2			3		
76		Facet			Facet			Facet		
77	G1	8			10			12		
78		4.83616	-1.58877	0.84115	4.73689	-1.63993	0.66301	4.64314	-1.69543	0.50201
79	Point 1	4.68429	-1.81884	0.74767	4.58926	-1.86587	0.57304	4.48446	-1.93076	0.39587
80	Point 2	4.67878	-1.78796	0.69779	4.58926	-1.86587	0.57304	4.48358	-1.92864	0.38888
81	Point 3	4.22223	-2.50841	0.44377	4.28260	-2.33583	0.38592	4.00469	-2.63997	0.07232
82	Point 4	4.05858	-3.52592	1.25078	4.08790	-3.53306	1.33026	3.80481	-3.82416	0.98868
83	Point 5	4.48417	-3.19384	1.84087	4.36259	-3.30509	1.72614	4.23639	-3.48214	1.60614
84	Point 6	4.48187	-3.13482	1.81374	4.36259	-3.30509	1.72614	4.23639	-3.48214	1.60614
85	Point 7	4.62128	-3.01193	2.00617	4.49650	-3.19395	1.91915	4.38485	-3.33084	1.80981
86	Point 8	4.63616	-1.58877	0.84115	4.73689	-1.63993	0.66301	4.64314	-1.69543	0.50201
87	Point 9	4.79136	-1.94631	1.15786	4.70000	-2.00000	1.00000	4.60451	-2.05611	0.83500
88	Start of scan line	4.79136	-1.94631	1.15786	4.70000	-2.00000	1.00000	4.60451	-2.05611	0.83500
89	Middle of rotation	4.79136	-1.94631	1.15786	4.70000	-2.00000	1.00000	4.60451	-2.05611	0.83500
90	End of scan line	4.69056	-2.50111	1.56984	4.58033	-2.64637	1.47458	4.46974	-2.76462	1.34651

FIG. 13B1

Station 1

MIR2

303/335

	A	B	C	D	E	F	G	H	I	J
91		Facet			Facet			Facet		
92	G2	7			9			11		
93	Point 1	3.38194	4.20092	1.75395	3.24016	4.43917	2.01655	3.11010	4.72655	2.34142
94	Point 2	3.16298	4.26385	1.78738	3.03125	4.49361	2.04162	2.88665	4.78740	2.37142
95	Point 3	3.16739	4.30137	1.83403	3.03125	4.49361	2.04162	2.88665	4.79258	2.37774
96	Point 4	2.50443	4.48930	1.90767	2.59900	4.60627	2.09349	2.21545	4.97231	2.46415
97	Point 5	1.39822	2.78582	-0.35302	1.44696	2.82994	-0.30174	1.08385	3.11226	-0.02918
98	Point 6	1.81707	2.39729	-0.75833	1.73748	2.57459	-0.65577	1.58833	2.71448	-0.41858
99	Point 7	1.85962	2.41646	-0.72451	1.73748	2.57459	-0.65577	1.57414	2.71711	-0.41422
100	Point 8	2.00251	2.29151	-0.84867	1.87437	2.45426	-0.67647	1.73191	2.58895	-0.53935
101	Point 9	3.38194	4.20092	1.75395	3.24016	4.43917	2.01655	3.11010	4.72655	2.34142
102	Start of scan line	3.14045	3.84870	1.27398	3.00728	4.05126	1.49719	2.86346	4.28889	1.75864
103	Middle of rotation	2.81784	3.26851	0.50471	2.60000	3.30000	0.50000	2.37384	3.33269	0.49511
104	End of scan line	2.37758	2.63817	-0.35149	2.22734	2.77028	-0.22004	2.06736	2.89843	-0.09537
105										

FIG. 13B2

Station 1

MR2

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FIG. 13B3

	A	B	C	D	E	F	G	H	I	J	K	L	M
106		Facet 1			Facet 2			Facet 3			Facet 4		
107	GS												
108	Point 1	4.36645	2.65376	0.19632	4.13039	2.57939	0.16456	3.80207	2.57127	0.13198	3.63965	2.48916	0.08731
109	Point 2	4.22326	2.82765	0.17673	3.98981	2.54637	0.14641	3.72893	2.54596	0.10897	3.48484	2.48924	0.07610
110	Point 3	4.17479	2.80928	0.18666	3.98898	2.55291	0.14522	3.69351	2.66181	0.10205	3.48484	2.48924	0.07610
111	Point 4	3.78748	2.62732	0.11577	3.58353	2.46410	0.09002	3.24144	2.51889	0.04122	3.13971	2.40274	0.02898
112	Point 5	3.59706	1.69846	0.16825	3.42901	-1.80124	0.14108	3.10857	-1.84718	0.09718	3.03926	-1.79742	0.08649
113	Point 6	4.00140	-2.16622	0.22737	3.86105	-1.97527	0.20449	3.58373	-2.06109	0.16749	3.40752	-1.93323	0.14032
114	Point 7	4.06710	-1.89198	0.23359	3.86230	-1.97181	0.20440	3.62949	-1.96992	0.17186	3.40752	-1.93323	0.14032
115	Point 8	4.22016	-2.04816	0.25587	4.01328	-2.05180	0.22675	3.80182	-2.02808	0.19711	3.57430	-1.99474	0.18470
116	Point 9	4.36845	2.65376	0.19632	4.13039	2.57939	0.16456	3.80207	2.57127	0.13198	3.63965	2.48916	0.08731
117	Start of scan line	4.40381	1.87632	0.21487	4.17745	1.84317	0.18369	3.94222	1.82246	0.15114	3.70025	1.80404	0.11760
118	Middle of rotation	4.29670	0.23013	0.22766	4.10000	0.25000	0.20000	3.89313	0.27090	0.17070	3.57474	0.29297	0.13978
119	End of scan line	4.30820	-1.26070	0.25535	4.10701	-1.26769	0.22718	3.89234	-1.26997	0.19985	3.86989	-1.27076	0.16576
120													

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Station 1 M2- XY Plane

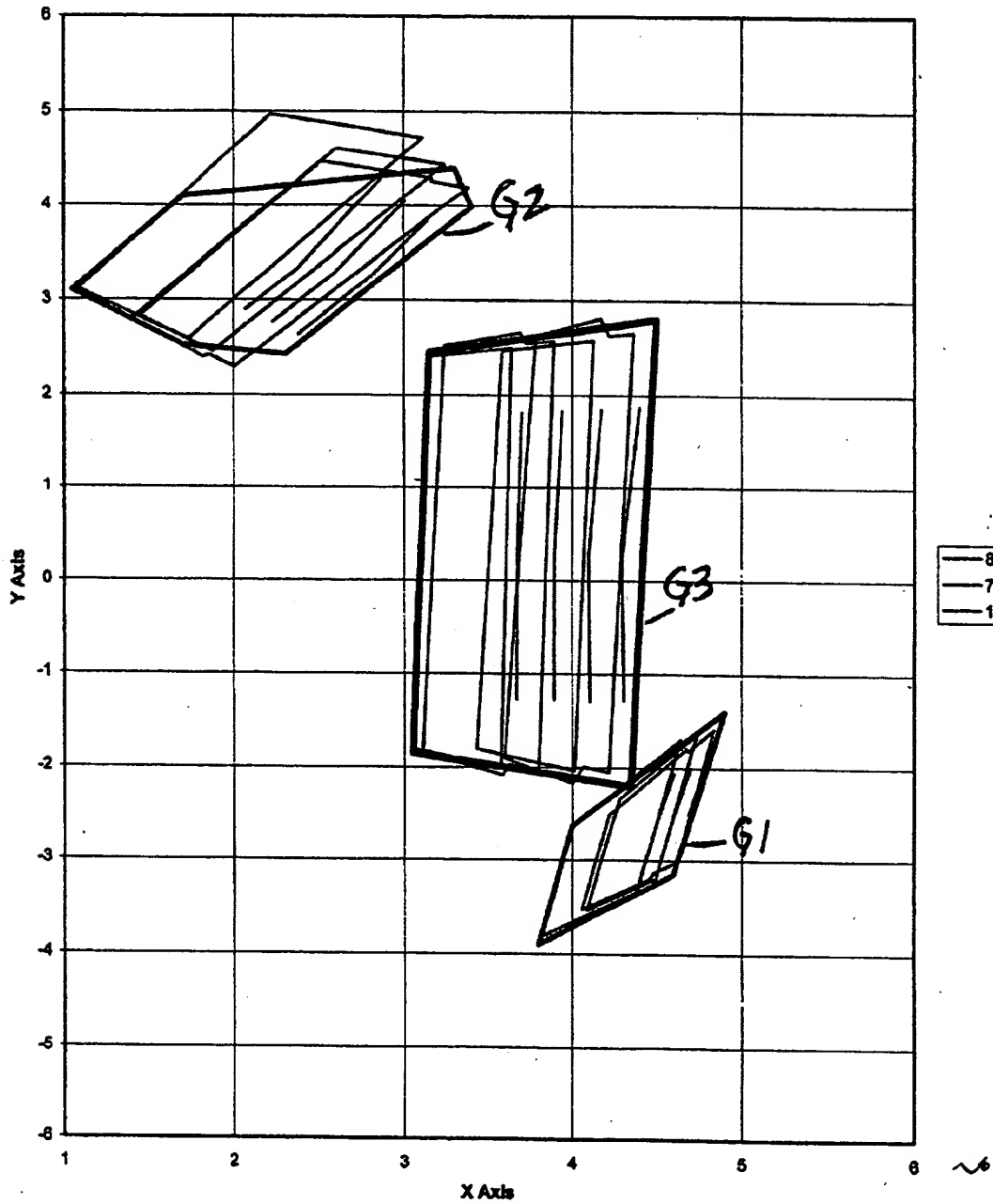


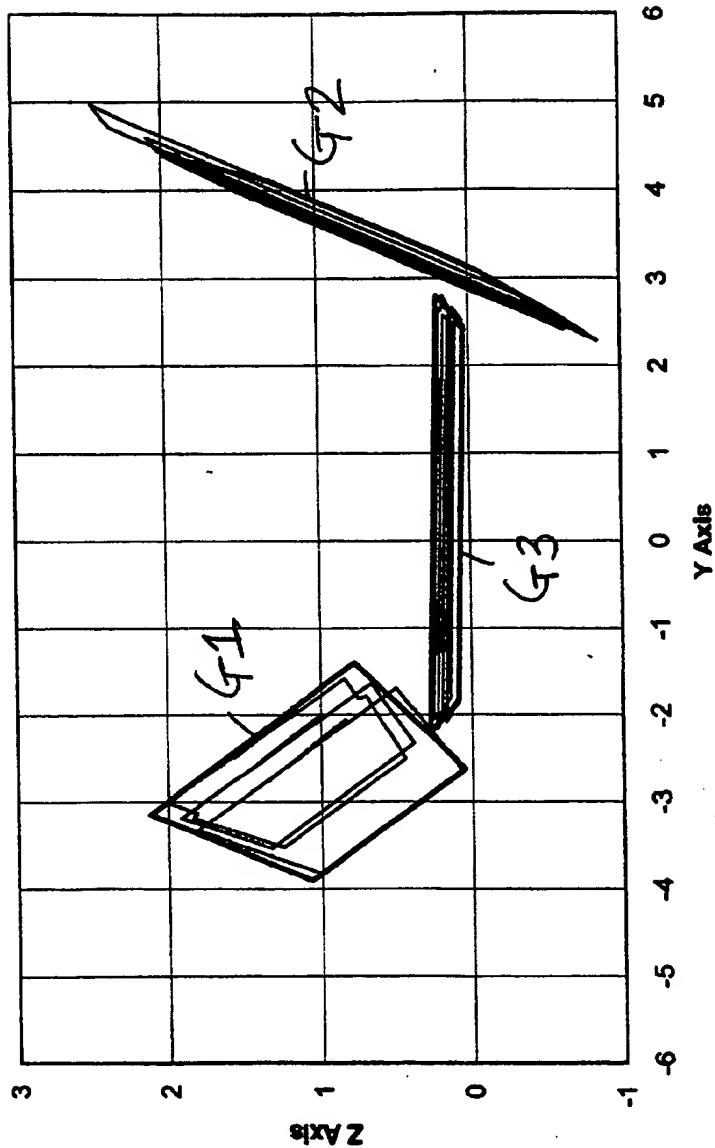
FIG. 13B4

Station 1

MR2.xv

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Station 1 M2 - YZ Plane



8
7
1

FIG. 13B6

MIR2.YZ

Station 1

368/335

	A	B	C	D	E	F	G	H	I	J
76		Facet			Facet			Facet		
77	G1	8			10			12		
78	Point 1	1.20537	-1.87340	0.83287	1.73454	-1.76256	0.57847	2.18607	-1.81295	0.33975
79	Point 2	1.50717	-1.82194	0.77007	2.01252	-1.90575	0.52600	2.50076	-1.97982	0.28421
80	Point 3	1.53373	-1.80077	0.73570	2.01252	-1.90575	0.52600	2.50470	-1.97822	0.27888
81	Point 4	2.71992	-2.40114	0.50283	2.72609	-2.27331	0.39129	3.72551	-2.62604	0.06549
82	Point 5	2.86809	-3.52973	1.36131	2.87153	-3.67274	1.38541	3.86534	-3.82116	0.98584
83	Point 6	1.66004	-3.29877	1.91900	2.13984	-3.43596	1.73579	2.62296	-3.60007	1.57321
84	Point 7	1.63442	-3.25853	1.80105	2.13984	-3.43596	1.73579	2.61924	-3.59386	1.57028
85	Point 8	1.32257	-3.19447	2.04127	1.85089	-3.38194	1.87021	2.29384	-3.53522	1.72352
86	Point 9	1.20537	-1.87340	0.83287	1.73454	-1.76256	0.57847	2.18607	-1.81295	0.33975
87	Start of scan line	1.19058	-1.90430	1.03659	1.70000	-2.00000	0.80000	2.15170	-2.08486	0.59022
88	Middle of rotation	1.19058	-1.90430	1.03659	1.70000	-2.00000	0.80000	2.15170	-2.08486	0.59022
89	End of scan line	1.33110	-2.86918	1.75349	1.84105	-3.01433	1.56667	2.29073	-3.10310	1.36142
90										

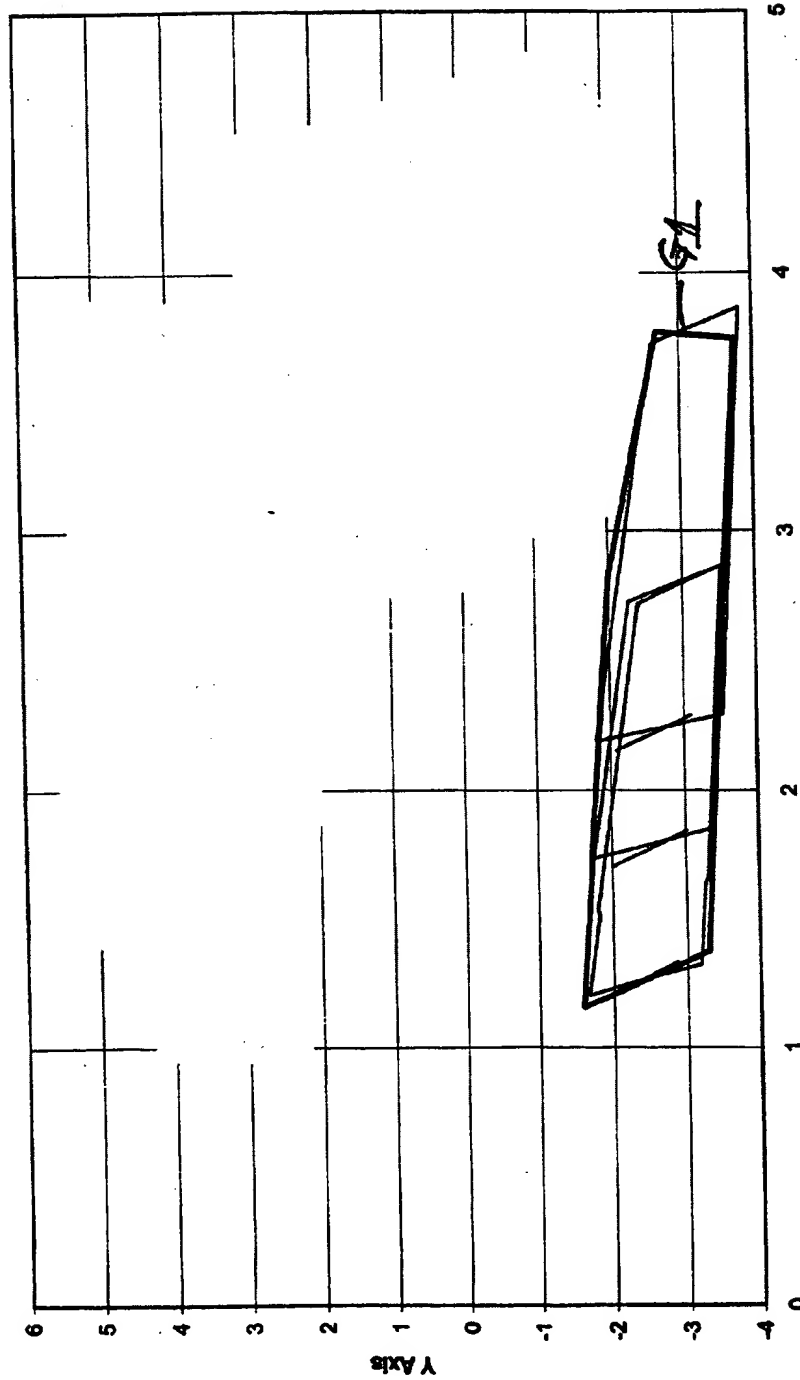
FIG. 13C1

Station 1

MR3

FIG. 13C2

Station 1 M3- XY Plane



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X Axis

FIG. 13C2

MR3.xy

Station 1

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Station 1 M3 - XZ Plane

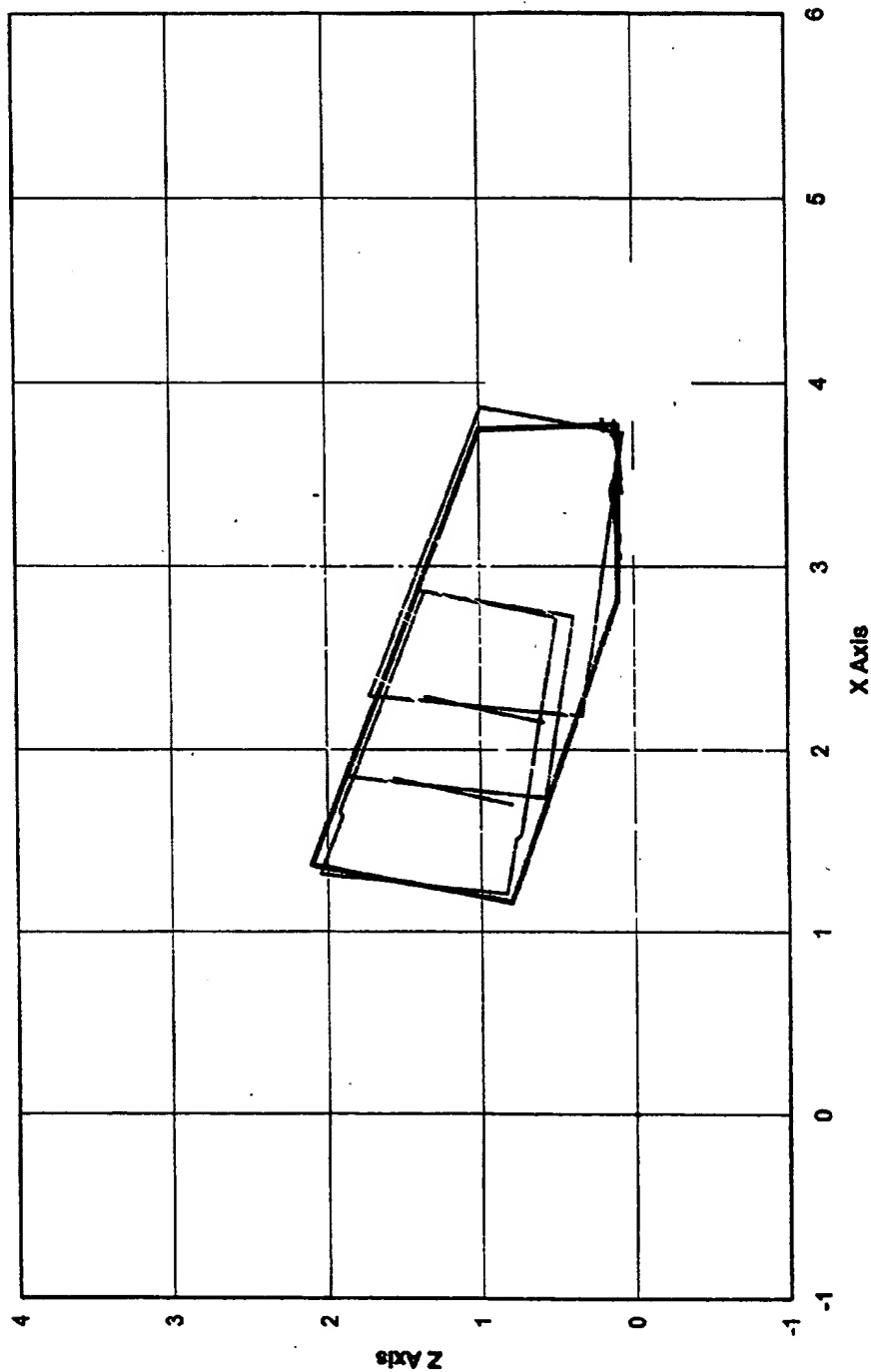


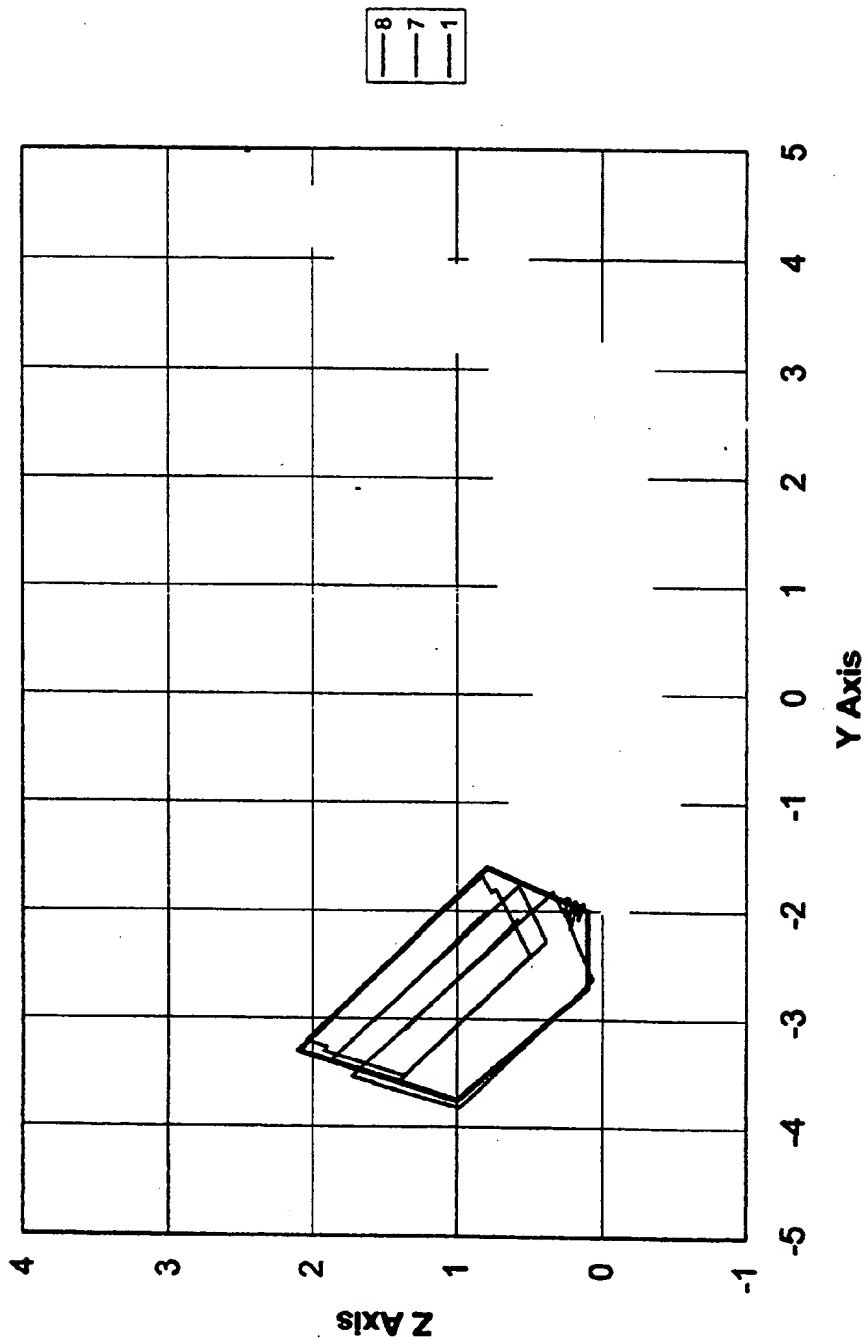
FIG. 13C3

MR3.XZ

Station 1

FIG. 10 - SECTION

Station 1 M3 - YZ Plane



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FIG. 13C4

Station 1

MR3.YZ

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	A	B	C	D	E	F	G	H	I	J
75		1			2					
76		Facet			Facet			Facet		
77	G1	8			10			12		
78	Point 1	1.20537	-1.67340	0.83287	1.73454	-1.76258	0.57847	2.18607	-1.81295	0.33975
79	Point 2	1.50717	-1.82194	0.77007	2.01252	-1.90575	0.52600	2.50076	-1.97862	0.28421
80	Point 3	1.53373	-1.80077	0.73570	2.01252	-1.90575	0.52600	2.50470	-1.97622	0.27888
81	Point 4	2.71982	-2.40114	0.50283	2.72609	-2.27331	0.39129	3.72651	-2.82604	0.06549
82	Point 5	2.86809	-3.52973	1.36131	2.87163	-3.67274	1.39541	3.86534	-3.82116	0.98594
83	Point 6	1.66004	-3.29877	1.91900	2.13984	-3.43596	1.73579	2.82296	-3.60007	1.57321
84	Point 7	1.63442	-3.25853	1.90105	2.13984	-3.43596	1.73579	2.81924	-3.59386	1.57029
85	Point 8	1.32257	-3.19447	2.04127	1.85089	-3.38194	1.87021	2.29384	-3.53522	1.72352
86	Point 9	1.20537	-1.67340	0.83287	1.73454	-1.76258	0.57847	2.18607	-1.81295	0.33975
87	Start of scan line	1.19058	-1.90430	1.03659	1.70000	-2.00000	0.80000	2.15170	-2.08486	0.59022
88	Middle of rotation	1.19058	-1.90430	1.03659	1.70000	-2.00000	0.80000	2.15170	-2.08486	0.59022
89	End of scan line	1.33110	-2.85916	1.75349	1.84105	-3.01433	1.56867	2.29073	-3.10310	1.36142
90										

FIG. 13D1

Station 1

MR4

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FIG. 14A1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
105																			
106																			
107	Point 1	5.04006	0.82476	1.78114	4.94178	0.55167	1.81997	4.85731	0.53894	1.85981	4.78146	0.57405	1.82423	4.59484	0.58809	2.02061	4.42093	0.60383	2.12116
108	Point 2	4.87042	0.44428	1.88123	4.71199	0.48555	1.91816	4.67548	0.45650	1.97394	4.58109	0.48315	2.02853	4.39766	0.49153	2.13459	4.21528	0.51160	2.23831
109	Point 3	4.63173	0.85033	1.83350	4.77425	0.47110	1.91887	4.65020	0.40066	1.99566	4.58109	0.48315	2.02853	4.39766	0.49153	2.13459	4.21528	0.51160	2.23831
110	Point 4	4.32159	0.26598	2.17873	4.54022	0.20212	2.22651	4.09186	0.29949	2.31139	4.14950	0.27790	2.27807	3.77405	0.21047	2.48515	3.84488	0.34144	2.49421
111	Point 5	4.34770	-1.84948	2.18347	4.26892	-1.86717	2.20444	4.00791	-1.77102	2.31400	4.12497	-1.82124	2.28225	3.74166	-1.48848	2.51368	3.76318	-1.27108	2.48410
112	Point 6	4.77237	-3.26670	1.91714	4.71824	-2.17632	1.94864	4.56410	-2.15789	2.02634	4.49172	-2.17143	2.08019	4.30150	-1.80374	2.19016	4.13835	-1.47058	2.28353
113	Point 7	4.65578	-2.74328	1.81126	4.70459	-2.17118	1.94701	4.60658	-2.01865	2.01578	4.49172	-2.17143	2.08019	4.30150	-1.78844	2.18824	4.13835	-1.47058	2.28353
114	Point 8	4.96278	-2.13285	1.88126	4.70459	-2.17118	1.94701	4.60658	-2.01865	2.01578	4.49172	-2.17143	2.08019	4.30150	-1.78844	2.18824	4.13835	-1.47058	2.28353
115	Point 9	4.96278	-2.13285	1.88126	4.70459	-2.17118	1.94701	4.60658	-2.01865	2.01578	4.49172	-2.17143	2.08019	4.30150	-1.78844	2.18824	4.13835	-1.47058	2.28353
116	Start of main line	5.00000	0.00000	1.78114	4.94178	0.55167	1.81997	4.85731	0.53894	1.85981	4.78146	0.57405	1.82423	4.59484	0.58809	2.02061	4.42093	0.60383	2.12116
117	End of main line	5.00000	0.00000	1.78114	4.94178	0.55167	1.81997	4.85731	0.53894	1.85981	4.78146	0.57405	1.82423	4.59484	0.58809	2.02061	4.42093	0.60383	2.12116
118	Start of main line	5.00000	0.00000	1.78114	4.94178	0.55167	1.81997	4.85731	0.53894	1.85981	4.78146	0.57405	1.82423	4.59484	0.58809	2.02061	4.42093	0.60383	2.12116
119	End of main line	5.00000	0.00000	1.78114	4.94178	0.55167	1.81997	4.85731	0.53894	1.85981	4.78146	0.57405	1.82423	4.59484	0.58809	2.02061	4.42093	0.60383	2.12116
120	End of main line	5.00000	-1.14655	1.78114	4.94178	-1.22586	1.81997	4.85731	-1.20332	1.87053	4.78001	-1.18617	1.82507	4.57039	-0.65537	2.02470	4.40142	-0.24218	2.12840

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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
108																			
109																			
110																			
111																			
112																			
113																			
114																			
115																			
116																			
117																			
118																			
119																			
120																			

FIG. 14B1

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101	101
102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102	102
103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103
104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104	104
105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105	105
106	106	106	106	106	106	106	106	106	106	106	106	106	106	106	106	106	106	106
107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107	107
108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108	108
109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109	109
110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110
111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111	111
112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112	112
113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114	114
115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115
116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116	116
117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117	117
118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118	118
119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119	119
120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120

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FIG. 14C1

[illegible]

FIG. 14D1

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[illegible]

FIG. 15A1

	A	B	C	D	E	F	G	H	I	J
91		Facet			Facet			Facet		
92	G2	7			9			11		
93	Point 1	5.95867	4.37550	6.46837	5.71110	4.43267	6.63764	5.45432	4.80159	6.83568
94	Point 2	5.83655	4.33627	6.53803	5.60403	4.39100	6.69722	5.33250	4.55423	6.90349
95	Point 3	5.82668	4.38204	6.55370	5.60403	4.39100	6.69722	5.33088	4.56037	6.90578
96	Point 4	5.44406	4.23150	6.76631	5.37166	4.30055	6.82854	4.94319	4.40584	7.12079
97	Point 5	5.35054	1.10363	6.18430	5.33722	1.01369	6.17433	4.95130	1.10154	6.43794
98	Point 6	5.79099	0.77284	5.83618	5.62511	0.81564	5.95052	5.42531	0.80078	6.07461
99	Point 7	5.80762	0.82205	5.83575	5.62511	0.81564	5.95052	5.42747	0.80763	6.07484
100	Point 8	5.95032	0.72592	5.72516	5.75912	0.72344	5.84633	5.57831	0.71341	5.95933
101	Point 9	5.95867	4.37550	6.46837	5.71110	4.43267	6.63764	5.45432	4.60159	6.83568
102	Start of scan line	5.95828	3.76722	6.34386	5.72650	3.84809	6.50794	5.48105	3.93033	6.68100
103	Middle of rotation	6.00363	1.72998	5.89717	5.80862	1.82630	6.00000	5.61481	1.82325	6.10220
104	End of scan line	5.99623	1.21758	5.79678	5.80609	1.19815	5.91380	5.61623	1.19501	6.03397
105										

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FIG. 15A2

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FIG. 15B1

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	A	B	C	D	E	F	G	H	I	J
90										
91		Facet			Facet			Facet		
92	G2	7			9			11		
93	Point 1	5.89808	4.46565	6.39317	5.58735	4.60417	6.49668	5.31142	4.79243	6.68904
94	Point 2	5.72839	4.50585	6.39515	5.43660	4.63666	6.49349	5.13464	4.83220	6.68785
95	Point 3	6.73352	4.52709	6.42964	5.43660	4.63666	6.49349	5.13524	4.83496	6.69231
96	Point 4	5.22942	4.63324	6.41511	5.13129	4.70247	6.48702	4.61719	4.94977	6.68618
97	Point 5	3.75453	3.01427	3.40306	3.51489	3.05022	3.37382	2.92561	3.22999	3.44252
98	Point 6	3.98793	2.83938	3.21628	3.63983	2.86298	3.28365	3.16395	3.07385	3.28633
99	Point 7	4.01214	2.84817	3.23834	3.63983	2.86298	3.28365	3.16721	3.07489	3.28909
100	Point 8	4.09124	2.79379	3.18258	3.69818	2.92223	3.24153	3.24420	3.02504	3.23954
101	Point 9	5.89808	4.46565	6.39317	5.58735	4.60417	6.49668	5.31142	4.79243	6.68904
102	Start of scan line	5.66800	4.26040	5.99609	5.37598	4.41413	6.12962	5.05851	4.57920	6.27163
103	Middle of rotation	4.65630	3.25182	4.08689	4.20000	3.30000	4.00000	3.71220	3.35150	3.90711
104	End of scan line	4.26503	2.91167	3.42532	3.84166	3.00957	3.42658	3.41287	3.12422	3.45169
105										

FIG. 15B2

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FIG. 15B3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
100		Face			Face			Face			Face			Face			Face		
107/33		1			2			3			4			5			6		
108	Point 1	7.30463	0.38621	3.60067	7.31635	0.35437	3.81596	7.28212	0.36293	4.00443	7.17867	0.36064	4.26673	7.03828	0.34681	4.74102	6.87189	0.34612	6.95844
109	Point 2	7.32699	0.30077	3.72283	7.27018	0.29548	3.83263	7.20014	0.33020	4.18642	7.13133	0.29162	4.38728	6.97894	0.32018	4.68859	6.81701	0.32008	6.90895
110	Point 3	7.35066	0.42514	3.78948	7.27046	0.29830	3.83374	7.20680	0.33866	4.19784	7.13000	0.29162	4.38728	6.97894	0.32024	4.68874	6.81701	0.32008	6.90895
111	Point 4	7.18689	0.18089	4.06889	7.13404	0.12287	4.28827	7.04632	0.16078	4.57132	7.02005	0.18654	4.65113	6.91288	0.19394	5.31804	6.72143	0.18544	6.84179
112	Point 5	7.18689	0.18089	4.06889	7.13404	0.12287	4.28827	7.04632	0.16078	4.57132	7.02005	0.18654	4.65113	6.91288	0.19394	5.31804	6.72143	0.18544	6.84179
113	Point 6	6.82235	-2.11194	3.65300	6.82235	-2.84072	3.83354	6.61106	-2.72095	4.17629	6.50131	-2.83734	3.86660	6.37435	3.60034	4.82141	6.24184	-3.12048	6.28235
114	Point 7	6.86186	-2.18529	3.38218	6.78939	-2.85837	3.51184	6.62686	-2.88997	3.80174	6.41689	-3.00596	3.86660	6.27824	3.57119	4.48184	6.24184	-3.12048	6.28235
115	Point 8	6.83064	-2.80460	3.32407	6.78939	-2.85837	3.51184	6.62686	-2.88997	3.80174	6.41689	-3.00596	3.86660	6.27824	3.57119	4.48184	6.24184	-3.12048	6.28235
116	Point 9	6.83064	-2.80460	3.32407	6.78939	-2.85837	3.51184	6.62686	-2.88997	3.80174	6.41689	-3.00596	3.86660	6.27824	3.57119	4.48184	6.24184	-3.12048	6.28235
117	Start of scan line	7.32325	0.00000	3.67545	7.29980	0.00000	3.78343	7.16246	0.00000	4.00000	7.12386	0.00000	4.22381	6.97894	0.00000	4.68859	6.81701	0.00000	6.91131
118	Middle of scan line	7.32325	0.00000	3.67545	7.29980	0.00000	3.78343	7.16246	0.00000	4.00000	7.12386	0.00000	4.22381	6.97894	0.00000	4.68859	6.81701	0.00000	6.91131
119	End of scan line	7.01771	-2.11473	3.23472	6.82439	-2.31840	3.41071	6.57865	-3.14504	3.68987	6.77380	-2.39464	3.83354	6.45346	2.23783	4.38860	6.44851	-2.40436	4.84723

F16.15C1

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Fig. 15c2

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FIG. 15C3

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
	Face			Face			Face			Face			Face			Face		
100	1			2			3			4			5			6		
101	7.9433	0.3631	3.6027	7.3163	0.3543	3.5168	7.2512	0.3529	4.0345	7.1787	0.3504	4.2657	7.0908	0.3481	4.7112	6.9719	0.3451	5.2544
102	7.9383	0.3607	3.7226	7.2716	0.3504	3.6028	7.2014	0.3490	4.1842	7.1303	0.3476	4.3678	7.0784	0.3454	4.8559	6.9170	0.3427	5.4086
103	7.9333	0.3584	3.7949	7.2746	0.3480	3.6837	7.2080	0.3466	4.1794	7.1303	0.3452	4.3678	7.0784	0.3430	4.8559	6.9170	0.3403	5.4086
104	7.9283	0.3561	3.8672	7.2776	0.3456	3.7650	7.2114	0.3442	4.1746	7.1303	0.3428	4.3678	7.0784	0.3406	4.8559	6.9170	0.3376	5.4086
105	7.9233	0.3538	3.9395	7.2806	0.3432	3.8463	7.2144	0.3418	4.1698	7.1303	0.3404	4.3678	7.0784	0.3384	4.8559	6.9170	0.3354	5.4086
106	7.9183	0.3515	4.0118	7.2836	0.3408	3.9276	7.2174	0.3394	4.1650	7.1303	0.3380	4.3678	7.0784	0.3362	4.8559	6.9170	0.3324	5.4086
107	7.9133	0.3492	4.0841	7.2866	0.3384	4.0089	7.2204	0.3370	4.1602	7.1303	0.3356	4.3678	7.0784	0.3342	4.8559	6.9170	0.3294	5.4086
108	7.9083	0.3469	4.1564	7.2896	0.3360	4.0902	7.2234	0.3346	4.1554	7.1303	0.3332	4.3678	7.0784	0.3318	4.8559	6.9170	0.3264	5.4086
109	7.9033	0.3446	4.2287	7.2926	0.3336	4.1715	7.2264	0.3322	4.1506	7.1303	0.3308	4.3678	7.0784	0.3294	4.8559	6.9170	0.3234	5.4086
110	7.8983	0.3423	4.3010	7.2956	0.3312	4.2528	7.2294	0.3298	4.1458	7.1303	0.3284	4.3678	7.0784	0.3270	4.8559	6.9170	0.3204	5.4086
111	7.8933	0.3400	4.3733	7.2986	0.3288	4.3341	7.2324	0.3274	4.1410	7.1303	0.3260	4.3678	7.0784	0.3246	4.8559	6.9170	0.3174	5.4086
112	7.8883	0.3377	4.4456	7.3016	0.3264	4.4154	7.2354	0.3250	4.1362	7.1303	0.3236	4.3678	7.0784	0.3222	4.8559	6.9170	0.3144	5.4086
113	7.8833	0.3354	4.5179	7.3046	0.3240	4.4967	7.2384	0.3226	4.1314	7.1303	0.3212	4.3678	7.0784	0.3200	4.8559	6.9170	0.3114	5.4086
114	7.8783	0.3331	4.5902	7.3076	0.3216	4.5780	7.2414	0.3202	4.1266	7.1303	0.3188	4.3678	7.0784	0.3174	4.8559	6.9170	0.3074	5.4086
115	7.8733	0.3308	4.6625	7.3106	0.3192	4.6593	7.2444	0.3178	4.1218	7.1303	0.3164	4.3678	7.0784	0.3150	4.8559	6.9170	0.2994	5.4086
116	7.8683	0.3285	4.7348	7.3136	0.3168	4.7406	7.2474	0.3154	4.1170	7.1303	0.3140	4.3678	7.0784	0.3126	4.8559	6.9170	0.2944	5.4086
117	7.8633	0.3262	4.8071	7.3166	0.3144	4.8219	7.2504	0.3130	4.1122	7.1303	0.3116	4.3678	7.0784	0.3102	4.8559	6.9170	0.2894	5.4086
118	7.8583	0.3239	4.8794	7.3196	0.3120	4.9032	7.2534	0.3106	4.1074	7.1303	0.3092	4.3678	7.0784	0.3078	4.8559	6.9170	0.2844	5.4086
119	7.8533	0.3216	4.9517	7.3226	0.3096	4.9845	7.2564	0.3082	4.1026	7.1303	0.3068	4.3678	7.0784	0.3054	4.8559	6.9170	0.2794	5.4086
120	7.8483	0.3193	5.0240	7.3256	0.3072	5.0658	7.2594	0.3058	4.0978	7.1303	0.3044	4.3678	7.0784	0.3030	4.8559	6.9170	0.2744	5.4086

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	A	B	C	D	E	F	G	H	I	J
75		1			2			3		
76		Facet			Facet			Facet		
77	G1	8			10			12		
78	Point 1	4.09124	-2.79379	3.18258	3.69818	-2.92223	3.24153	3.24420	-3.02504	3.23954
79	Point 2	4.01214	-2.84817	3.23834	3.63983	-2.96298	3.25365	3.16721	-3.07489	3.28909
80	Point 3	3.98783	-2.83938	3.21628	3.63983	-2.96298	3.28365	3.16395	-3.07385	3.28633
81	Point 4	3.75453	-3.01427	3.40306	3.51489	-3.05022	3.37382	2.92561	-3.22999	3.44252
82	Point 5	5.22942	-4.63324	6.41511	5.13129	-4.70247	6.48702	4.61719	-4.94977	6.68618
83	Point 6	5.73352	-4.52709	6.42964	5.43660	-4.63666	6.49349	5.13524	-4.83496	6.69231
84	Point 7	5.72839	-4.50585	6.39515	5.43660	-4.63666	6.49349	5.13484	-4.83220	6.68785
85	Point 8	5.89808	-4.46565	6.39317	5.58735	-4.60417	6.49668	5.31142	-4.79243	6.68904
86	Point 9	4.09124	-2.79379	3.18258	3.69818	-2.92223	3.24153	3.24420	-3.02504	3.23954
87	Start of scan line	4.26503	-2.91167	3.42532	3.84166	-3.00957	3.42658	3.41287	-3.12422	3.45169
88	Middle of rotation	4.65630	-3.25182	4.08689	4.20000	-3.30000	4.00000	3.71220	-3.35150	3.90711
89	End of scan line	5.66800	-4.26040	5.99609	5.37598	-4.41413	6.12962	5.05851	-4.57920	6.27163
90										

FIG. 15D1

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FIG. 15D3

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
106		Face: 1			Face: 2			Face: 3			Face: 4			Face: 5			Face: 6		
107	0.3	7.25483	0.36521	3.60327	7.21035	0.35437	3.61836	7.25212	0.36353	4.03445	7.17867	0.36264	4.26373	7.02003	0.35981	4.74102	6.87159	0.34612	5.38344
108		Point 1	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
109		Point 2	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
110		Point 3	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
111		Point 4	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
112		Point 5	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
113		Point 6	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
114		Point 7	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
115		Point 8	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
116		Point 9	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
117		Start of scan line	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
118		Middle of scan line	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892
119		End of scan line	0.36577	3.72250	7.27018	0.35548	3.62289	7.20714	0.35320	4.18942	7.15303	0.35182	4.39774	6.97384	0.35018	4.88693	6.81701	0.33708	5.40892

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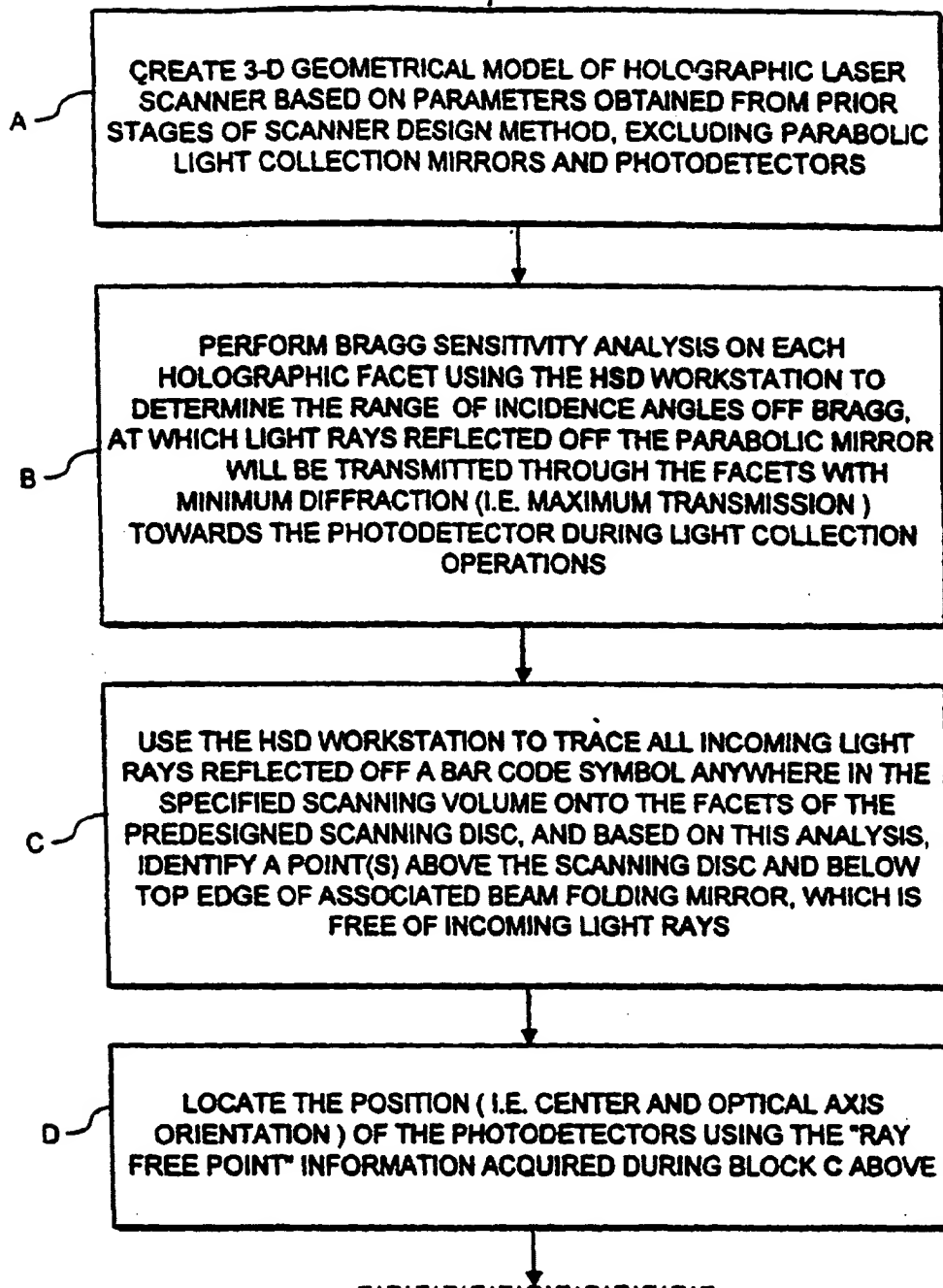


FIG. 16A

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E

SELECT A GENERALIZED PARABOLIC SURFACE FUNCTION FOR USE IN SPECIFYING THE PARABOLIC LIGHT FOCUSING MIRROR OF EACH LIGHT COLLECTION / DETECTION SUBSYSTEM

F

EXTEND THE GEOMETRICAL MODEL OF THE LIGHT COLLECTION / DETECTION SUBSYSTEM BY ADDING A LINE THERETO WHICH EXTENDS AT ONE OF ITS ENDS, FROM THE CENTER LOCATION OF THE PHOTODETECTOR PARALLEL TO AND ABOVE THE LINE OF LASER BEAM INCIDENCE TO THE SCANNING DISC

G

SPECIFYING THE FOCAL LENGTH PARAMETER OF THE PARABOLIC SURFACE FUNCTION USED TO REPRESENT THE PARABOLIC MIRROR IN THE GEOMETRICAL MODEL OF THE LIGHT COLLECTION / DETECTION SUBSYSTEM

H

DETERMINE WHICH HOLOGRAPHIC FACET ON THE SCANNING DISC DESIGN HAS THE SMALLEST INNER RADIUS, r_i , AND THEN USE THIS FACET TO DETERMINE THE LENGTHWISE DIMENSION OF THE PARABOLIC SURFACE PATH IN THE GEOMETRICAL MODEL OF THE LIGHT COLLECTION / DETECTION SUBSYSTEM

FIG. 16B

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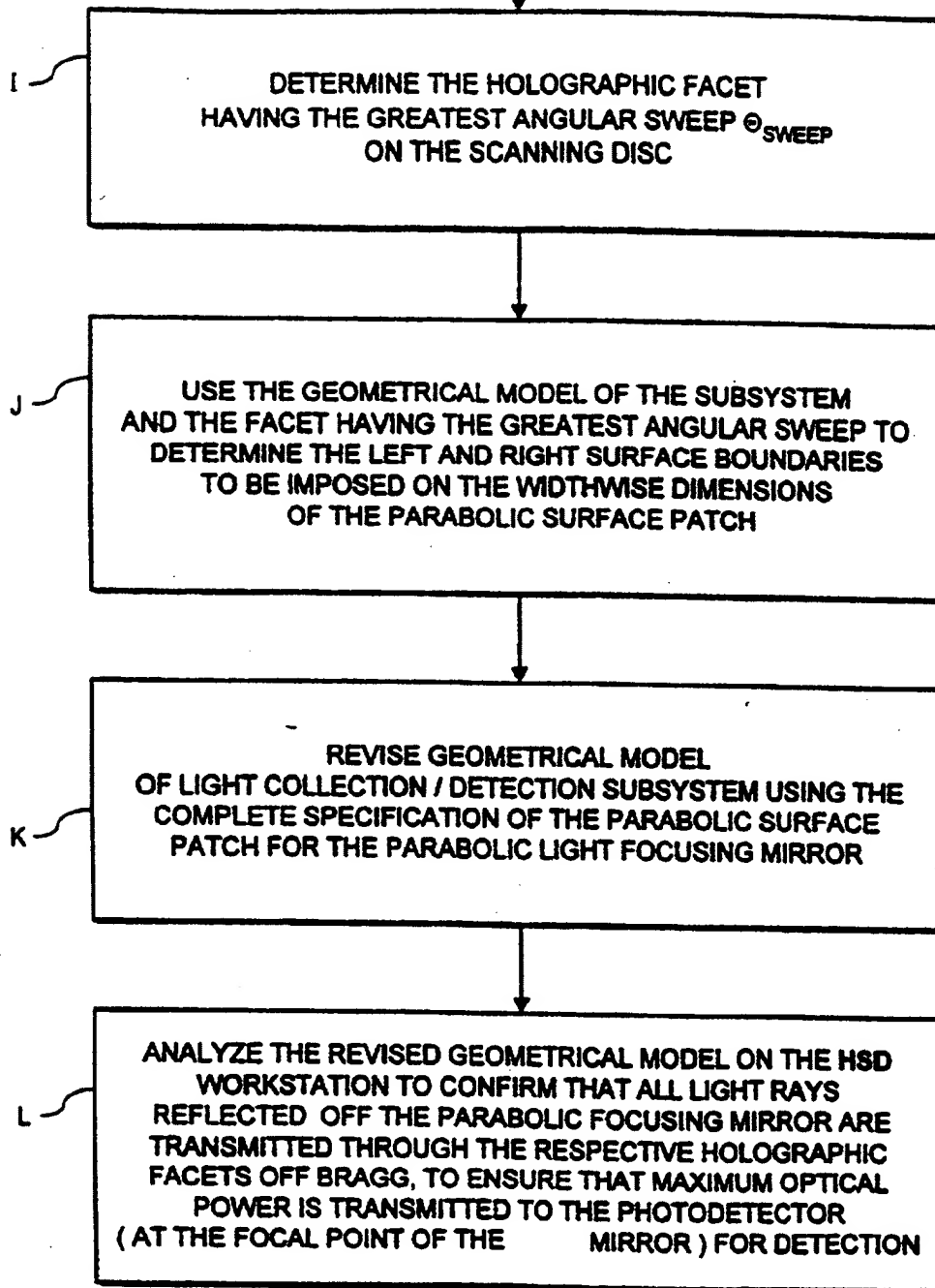
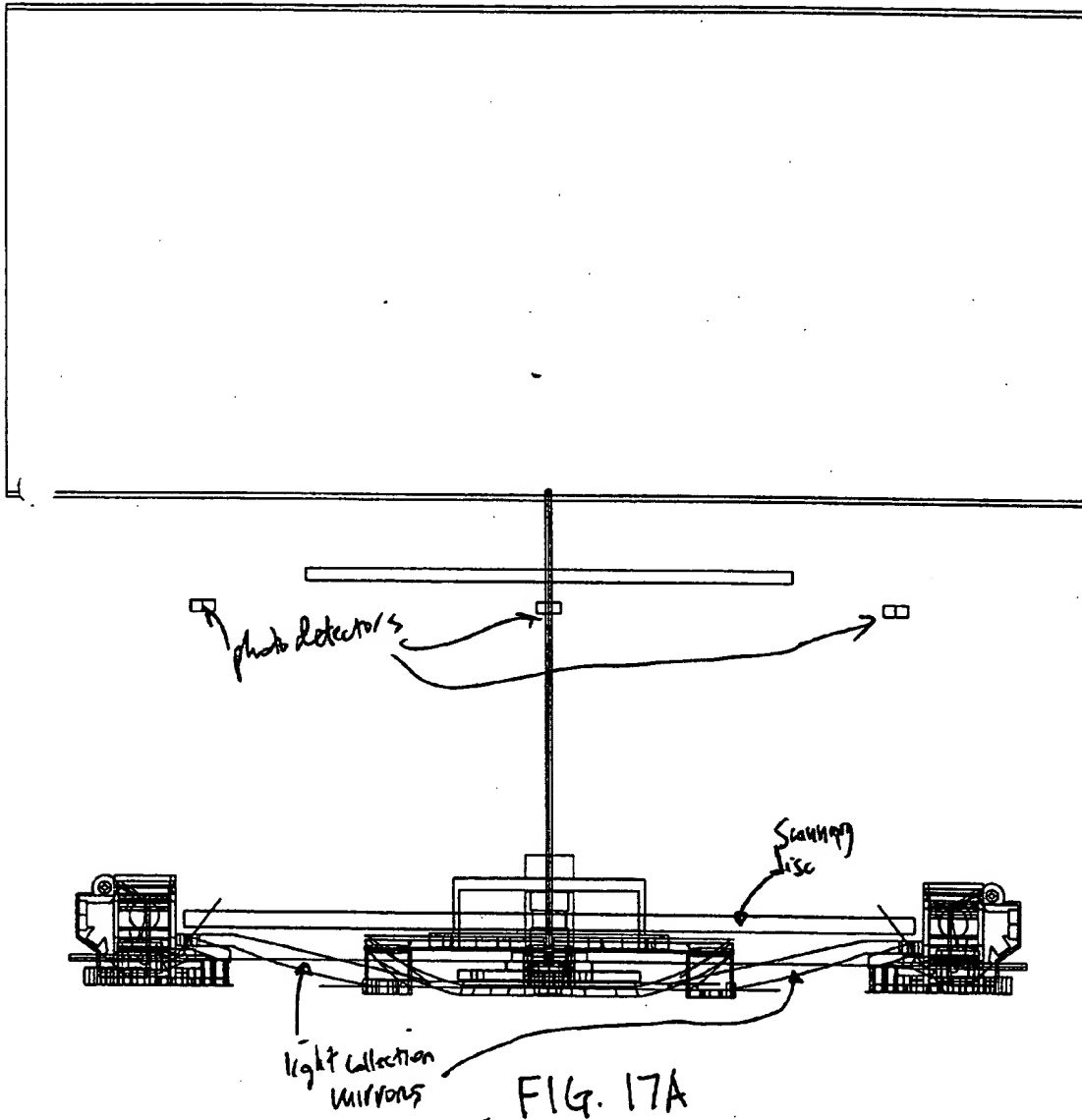


FIG. 16C

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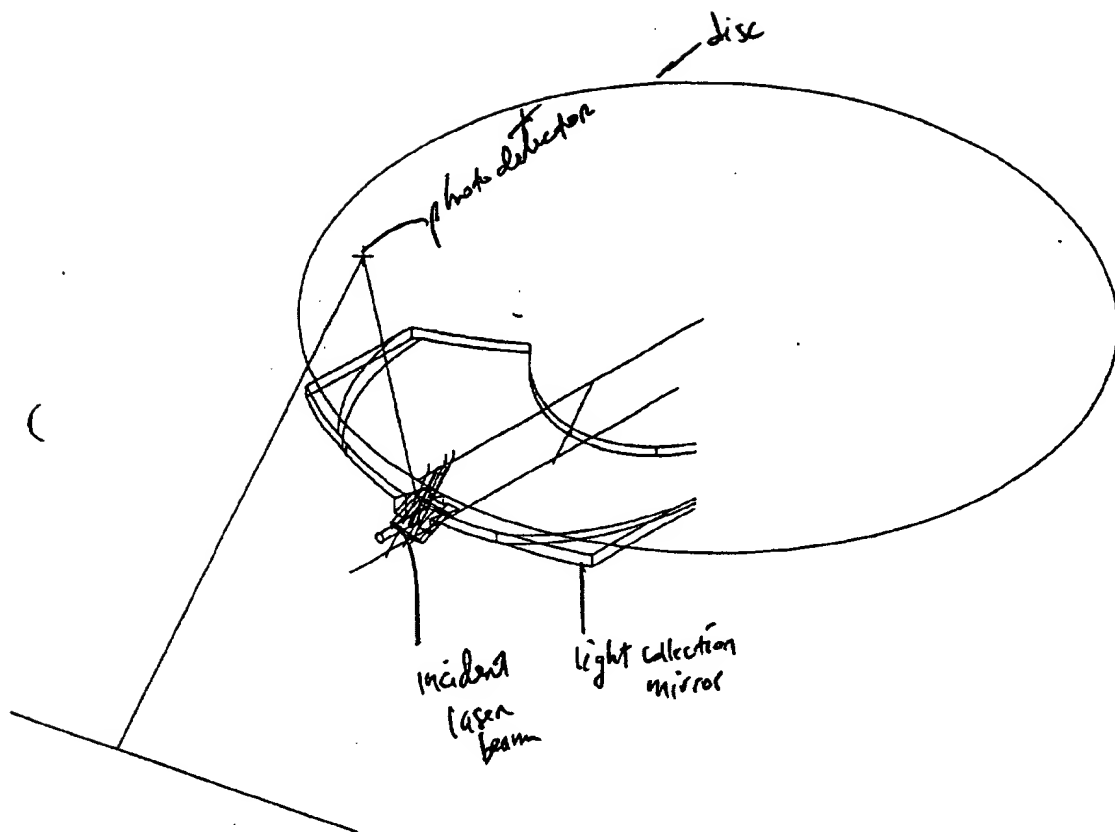


FIG. 17B

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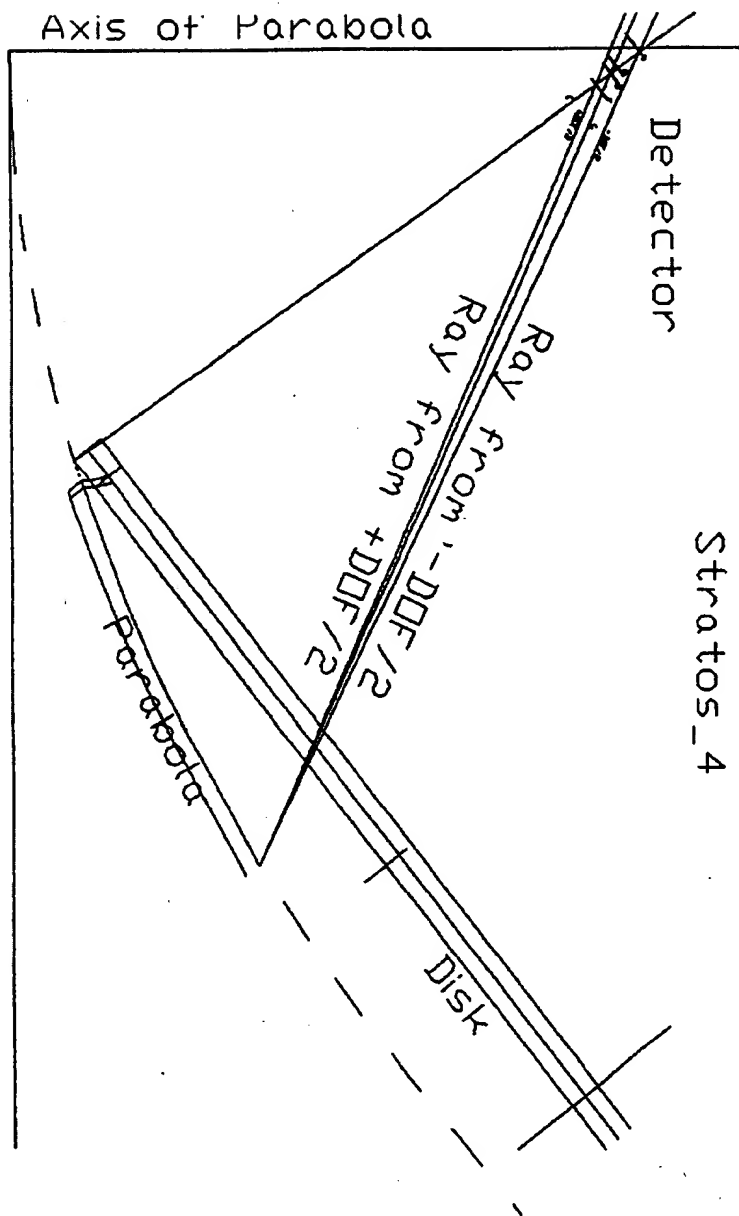


FIG. 17C

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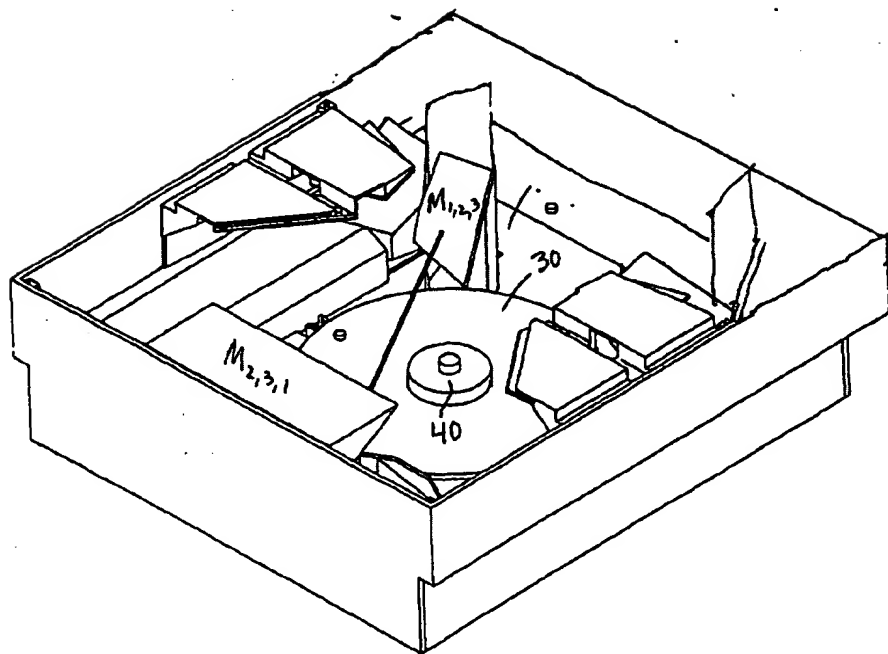


FIG 18

FIG 18

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